SIXTY-EIGHTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CVI.] NUMBER 21.]

NEW YORK, MAY 25, 1912

[10 CENTS A COPY $3.00 A YEAR

The new water supply is brought 240 miles from the Sierra Mountains to Los Angeles. Of this length, 47 miles is in tunnel and 9 1/3 miles consists of inverted steel siphons. Above is shown the nine-mile siphon, which is 10 feet in diameter.

STEEL SIPHONS OF THE LOS ANGELES AQUEDUCT.—[See page 476.]

SCIENTIFIC AMERICAN

Founded 1845

NEW YORK, SATURDAY, MAY 25, 1912

Published by Munn & Co., Incorporated. Charles Allen Munn, President
Frederick Converse Beach, Secretary and Treasurer;
all at 361 Broadway, New York

Entered at the Post Office of New York, N. Y., as Second Class Matter

Subscription Rates

Subscription one year $3.00
Postage prepaid in United States and possessions

Mexico, Cuba, and Panama

Subscriptions for Foreign Countries, one year, postage prepaid, 4.50
Subscriptions for Canada, one year, postage prepaid, ... 3.75

The Scientific American Publications

Scientific American (established 1845) . . . . . per year, $3.00
Scientific American Supplement (established 1876) . " 5.00
American Homes and Gardens . . . . . " 3.00

The combined subscription rates and rates to foreign countries including Canada, will be furnished upon application.

Remit by postal or express money order, bank draft or check

Munn & Co., Inc., 361 Broadway, New York

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

"A Stitch in Time—"

THE American traveler who has occasion to run his automobile over the splendid roads of Europe, will note, at intervals along the roadside, men engaged in breaking up stones. To one side of each man will be a pile of stone, broken to the required size. Nearby will be another pile, of sand and other road-mending material; also a wheelbarrow, a shovel and a pick-ax. Occasionally he will come across a man who is carefully patrolling the road and searching the surface for the first indication of wear. Presently, the man will stop, say opposite some small pool of water, left by a passing shower, which is to him an indication that a slight deterioration of the roadway has set in at that point. Taking his pickax, he will carefully break up the surface of the road and fill in the depression with some sand and broken stone, smoothing over the surface, and leaving the passing traffic to compact the newly-laid material.

Now, in these simple operations our observant tourist will see exemplified that system of careful supervision and constant repair to which the splendid roads of Europe owe their always superb condition. Long experience has taught the European road-builder that in this careful, detailed supervision, this ceaseless vigilance, and early detection and repair of the very first evidences of disintegration, lies the only practicable method of maintaining a highway in permanently good condition.

Unfortunately, the wholesale method of doing things which is characteristic of this country, has led us into methods of road maintenance which are diametrically opposed to those which have been followed so successfully in Europe—methods which have caused our thoroughfares to fall into that state of chronic disrepair which characterizes so large a part of our highway mileage.

This matter was referred to at considerable length in an editorial published in our issue of May 11th, 1912, when we drew attention to the fact that, after building a stretch of highway, we were apt to consider that the task was finished for all time, leaving the road to the mercy of the elements and the unending wear and tear of traffic. Instead of patrolling the new roadway by a force of skilled labor, properly equipped for the repair of any incipient disintegration, we allow the surface to be broken down under the stream of traffic, and only when the road has been so badly wrecked as to be unusable, do we begin to think about repairs. These are carried out in our usual wholesale fashion; traffic is for the time being completely disorganized, and when the repair job is completed, the roadway is once more left to undergo the old routine of destruction.

Now that the country is thoroughly awake to the serious nature of the road problem, we suggest that it would be the height of wisdom to set apart a portion of the appropriations for the training of a competent body of road-masters, whose course of instruction should include a visit to Europe to study the methods of road repair there employed. To these men should be entrusted the work of organizing and instructing a road-repair force which should be maintained continuously upon the job and held at the high standard efficiency which characterizes the section gangs, to whose care in entrusted the upkeep of our steam railroads.

A Woman Pioneer in Education

DURING the past few months every newspaper and magazine reader has become familiar with the name of Maria Montessori. Dr. Montessori is the first woman in modern times to promulgate a new system of education. It is not yet clear to what the great popular interest in the Montessori method is due. Is it the fact that we are all so much dissatisfied with the results of our educational efforts that we look with interest to every new method offered; or is it that we now have means for securing publicity that were not available to educational reformers of earlier times? Whatever the cause, the interest is well deserved. Here is a woman, scientifically trained, with a broad love of humanity and high educational ideals, who has devoted years of her life to developing what she considers a rational and effective method of educating children between the ages of three and six. She uses, to a great extent, methods that have been successful in the training of defectives. Applying them to normal children, her results have been truly remarkable. Great stress is laid upon sense training, and the sense training is at the basis of most of the educational activity.

Dr. Montessori's critics and enthusiastic admirers have both done her injustice. On the one hand, she has been hailed as an educational deliverer, and everything she does and approves has been branded as absolutely new and original. Revolutionary results were expected from the application of her methods. On the other hand, it has been pointed out that there is really little original in her methods, and that not all of the original is sound. She stands by no means alone in advocating a radical change in our attitude toward the child in school. We have with us John Dewey. His "School and Society," written fifteen years ago, on the basis of experiments with a school in which the children were given freedom and activity, is a harbinger of the Montessori plan. But it is a mistake to suppose that she has nothing new to contribute. Dr. Montessori has devised a series of self-checking activities, in connection with special apparatus, that keep the child occupied while permitting the teacher to do the more important work of studying the children for the purpose of discovering their capacities and needs. How her plan will work and how much modification it will need for children of different ages and different nations, only time can tell.

That the system will need modification goes without saying. No system is complete, nor do we want a complete system; there must be opportunity for adjustment to changing conditions. But of one thing there is no doubt:—we can make use of the spirit of Maria Montessori, without which the materials and the methods are barren. We can use the interest and enthusiasm aroused by her to teach again the old lesson that the form without the spirit is dead, to make us realize that although we have had kindergartens for many years, we have not made full use of the great ideas of Froebel and Pestalozzi. We still continue to treat children of six, in spite of Froebel and Pestalozzi, as though they were fundamentally different from children of five or five and a half. The student of child nature can find no gap in the development of the child corresponding with the gap in our methods.

The facetious query "What has become of the geniuses of our nursery?" becomes a serious accusation when it is discovered that the disappearance of the genius coincides with the beginning of "systematic education." We must give serious consideration to any earnest effort to improve the methods for the education of the young. We have had very good intentions, but what we need is light—more light.

The President Recommends a Patent Commission

IN a message to the Senate and House of Representatives, in which he points out how different are the industrial conditions of today from those of 1870, how combinations based upon patents have been formed, which have succeeded in controlling very largely the output of particular industries, how this control has been extended by contracts based upon new patents, to require the users of patented machines to buy supplies from the corporation owning the patent or from firms under their control, how large corporations by absorbing patents relating to particular arts have succeeded in dominating entire industries, so that the only market to which an inventor who improves such machines may offer his patents for sale is to such corporations, and how corporations sometimes buy patents simply to suppress them, the President of the United States asks Congress to have a careful study of the patent laws made by a commission of qualified persons, appointed for that purpose, with instructions to report such revisions of the patent laws as may be necessary to harmonize them with the best thought and needs of our time. Thus the President hopes to carry into effect the plan outlined in the resolution addressed to him some weeks ago by the Inventors' Guild of this city.

We have repeatedly stated in these columns that only by a painstaking study of the operation of the present patent law, a dispassionate study as free from "trust busting" proclivities as from too warm a regard for the patentee who wants to revolutionize an industry capitalized at hundreds of millions of dollars, would it be possible to obtain a clear conception of the merits and defects of our patent system. The mass of conflicting testimony which has been taken before the Committee on Patents, to which Mr. Oldfield's bill has been referred, conclusively shows the wisdom of such a course. It is to be hoped that Congress will lose no time in appropriating the necessary funds to carry out the President's suggestion.

The Gould-Scientific American Prize

THE closing date for the receipt of entries for the Gould-SCIENTIFIC AMERICAN prize is June 1st, 1912. From time to time the conditions which will govern the judges in awarding the prize of $15,000, so generously awarded by Mr. Edwin Gould through the SCIENTIFIC AMERICAN to the designer and demonstrator of the best machine that is driven by interchangeable power plants, have been published in these columns. Our readers are, therefore, familiar with them. While the final date of entry is June 1st, the machines themselves need not be submitted for examination and testing until July 4th, 1912, at a place to be announced in the SCIENTIFIC AMERICAN.

Mr. Gould's prize is the largest outstanding in the field of aviation. If it is not contested for this year it will be definitely withdrawn.

The primary consideration which has prompted Mr. Gould to offer his prize of $15,000 was that of safety. At the present writing nine deaths have been chronicled in the press in the short space of two weeks—much too dear a price to pay for the privilege of flying. While it is true, as many writers on aviation have pointed out, that the number of accidents per mile which have occurred in aeroplanes is considerably less than the corresponding number that can be charged to other forms of locomotion, it is equally true that not until the flying machine can be made as safe as the touring automobile, will aviation become popular. So far as we are aware, Mr. Gould is the only man who has offered to reward the inventor of a machine which will mark a step in the attainment of reasonable safety. Hitherto speed and long distance flying have prompted the offering of the prizes for which aviators have contended. The result has been that aviators are recruited from the ranks of circus acrobats, trick bicycle riders, automobile racers and trapeze performers. The prize-winning aviator of the day contributes little to the development of the flying machine. He has entered the field because aviation is no more dangerous than putting his head in a lion's mouth and far more profitable. Not until Mr. Gould's offer was announced was the inventor encouraged. Americans gave the world the first practical flying machine. Let us also hope that, thanks to the Gould prize, Americans will also evolve the first really safe machine.

The problem of designing and building a flying machine which will be driven by at least two motors that can be operated together or independently, presents no insuperable mechanical difficulties. Double-motor machines have been built by foreign manufacturers. Although most, if not all, of them would not fulfill the requirements of the Gould-SCIENTIFIC AMERICAN prize, they show that existing types need not be radically changed. At the Aero Show held in this city, there was exhibited a machine which might fulfill the conditions laid down for the Gould-SCIENTIFIC AMERICAN prize, at least so far as the power plant is concerned

Electricity

Another High-power Wireless Station in Italy.—The American consul at Genoa reports that the Italian government is about to construct another ultra-powerful wireless station at Brindisi, which will communicate with those at Corfu, Alexandria (Egypt), and Tobruk (Tripoli).

If the "Titanic" Had Been Equipped with Steam-electric Drive?—In connection with the official inquiries into the "Titanic" disaster, an English paper directs attention to the advantages of the steam-electric propulsion of vessels in the quickness with which the vessel may be stopped. The steam plant of such immense ships as the "Titanic" can not be shut down and reversed quickly, and after reversal the power is often much less than the power for normal running; whereas if steam turbines operating at the high speed required for the best efficiency are utilized to drive electric generators which in turn deliver their energy to motors on the propeller shafts running at the lower speed which is best for marine propulsion, the simple throwing over of a switch would give a retarding torque at the motors equal to the full power of the plant.

Magnetic Chucks for Machine Shop Work.—The time required to clamp castings or other pieces into place on the bed of a machine tool often seriously lowers the efficiency of the machine as a whole. The magnetic chuck reduces this waste of time and labor, and by a new improvement flat (or horizontal), vertical and rotary chucks of this type are equipped with interchangeable magnet coils for connection to lighting circuits of the standard voltages. They are also insulated with asbestos to withstand temperatures up to 400 deg. Fahr., and are rendered moisture proof. A further feature is a demagnetizing switch for readily releasing the work. Where direct current is not available a small generator, belted to the line shaft of the shop and supplying one to twelve chucks, is used.

Uniform Nomenclature for Wireless Telegraphy.—At present the whole literature of wireless telegraphy is encumbered with obscure usage of terms and with contradictory definitions which stand in the way of the most rapid progress of this art. The international wireless conference arranged for at London in June, at which a large number of experienced engineers will meet, with a mutual interest in the welfare of a single art, is expected to adopt a standard set of units and symbols. This official action, binding on wireless operators all over the world, will bring order out of chaos by distinguishing between antenna and "radiation" resistances, by rating transmitting outfits not by power input alone but with due regard to their efficiency, by determining the meaning of the term "frequency," whether as number of cycles per second or number of half-cycles per second, and by cutting out duplication of terms such as "jigger" and "oscillation transformer," "group frequency" and "spark frequency," and the like.

Electrifying a Steam Railroad at Minimum Expense.—The Berlin Stadtbahn, which joins the principal parts of the German capital with its suburbs, is to be electrified in order to provide for greatly increased traffic. Electric locomotives, 557 in number, will be employed—not motor cars. According to a recent report of the Railway Ministry these locomotives will show advantages in that they are less destructive to the permanent way than either steam locomotives or electric motor cars, and consume less energy on account of the higher efficiency of their comparatively large motors, while their use permits the retaining of a very large amount of existing rolling stock belonging to the road. The electric trains at the hours of densest traffic will consist of thirteen 6-wheel coaches propelled by two single-phase locomotives, one at each end of the train and operated from the forward cab by a simplified multiple-unit control. Electrical energy at 15,000 volts will be supplied from two power stations, one in a brown-coal field about 80 miles from Berlin and the other located in the city and intended to take care of peak loads.

Heating an Office Building by Electricity.—Cheap hydro-electric power, generated on the Snake River, Idaho, has developed the city of Twin Falls very rapidly and has even rendered practicable the electric heating of buildings. In place of steam radiators electric heating units have been installed in the vicinity of Twin Falls to the extent of nearly 1,000 kilowatts connected load. A 6-room house having eight outlets uses $70 to $100 worth of electrical energy during the season of eight months. A building having stores and offices on the first floor and a ballroom on the second floor uses 100 kilowatts for the season, costing $625. Three-phase current is brought into this building through an underground conduit at 2,300 volts and transformed to 220 volts for the forty electric radiators and a water-tank heater which keeps water continually at the boiling-point through thermostatic control. The size of the building is 50 by 120 feet, and the electrical equipment cost about $1,000, exclusive of the cost of the transformers, which were furnished by the power company.

Science

The Pontoon Bridge at Cologne.—The bridge of boats over the Rhine at Cologne, so well known to travelers, is to fall a victim to the prosaic spirit of "progress." It will be replaced by a steel structure, providing for double tramways, wagon traffic and foot passengers. The details of construction are not yet settled. A commission was recently sent to Budapest to inspect the great suspension bridge over the Danube, and it may decide on a similar structure for Cologne.

United Nigeria.—The latest change in the kaleidoscopic map of Africa results from the union of the British colonies of Northern and Southern Nigeria into one government, Nigeria, a step decided upon in February of this year. (The districts of Lagos and Southern Nigeria were united in February, 1906.) The country is now traversed from south to north by a line of railway extending to Kano, not far from the northern border. The first governor of Nigeria will be Sir Frederick Lugard, who was identified with the progress of this part of West Africa for a number of years before he was appointed governor of Hong Kong.

Educational Moving Pictures.—It is announced that Thomas A. Edison is to spend a large sum of money in perfecting the moving picture for school use. Mr. Arthur D. Chandler, President of the Orange Board of Education, told the New England Society on May 5th last all about Mr. Edison's plans. Mr. Edison is confident that the moving picture film is destined to become an indispensable adjunct to the school room. Mr. Edison has already had a number of films made, among them one which shows magnified millions of times, the process of chemical crystallization of certain substances. According to Mr. Chandler, the film is deeply impressive, because it shows there must be some force that controls even the action of inorganic matter.

The Meteorological Service of South Africa.—The Union of South Africa has decided to establish a general meteorological service, which will supplant the separate services heretofore maintained by Cape Colony, the Orange River Colony and the Transvaal. A similar amalgamation of a number of provincial meteorological services occurred in Australia after the formation of the Australian Commonwealth, and the result has been a happy one both for the country immediately concerned and for the science of meteorology. The opportunity for improvement is even greater in South Africa, where the practical side of meteorology has hitherto been somewhat neglected. It is one of the few fully civilized countries that has never undertaken the publication of daily weather maps.

Do Fishes Remember?—Continuing his experiments as to whether fish possess memory or association of ideas, M. Oxner obtains some further results. He already found that by placing a red cylinder containing food and also an empty green cylinder in the aquarium with a single fish, the latter soon learned to enter the red cylinder each time it was immersed and avoided the other one. In his later researches he finds that the fish goes into the red vessel and waits until some crumbs are dropped into it, which he then eats. A more striking point is that at other times the fish enters the baited red vessel even though he does not appear to desire food, seeing that he does not eat at such times. The factor of hunger was therefore eliminated here and we have to do with a habit or a reflex action.

The Penetration of Water by the Different Rays of the Spectrum.—An important investigation of the penetrative power of different colored rays of light in water has been recently undertaken by Helland-Hansen. The experiments were conducted from the "Michael Sars," the ship equipped by the Norwegian government for oceanographic study. The measurements quoted below were taken in the sea south and west of the Azores and the results were as follows: The luminous solar rays penetrated to a depth of 100 meters, but even at that depth the red rays are more attenuated than the violet rays. At 500 meters the red rays are entirely absorbed. A photographic plate is still distinctly impressed. At 1,000 meters the violet and ultra-violet are still perceptible. At 1,700 meters there is no longer the least trace of light.

Snelling Gas.—In a recent issue of the SCIENTIFIC AMERICAN, we stated in a comment on Snelling gas that 2,000 cubic feet of it could be stored in a steel bottle of rather small size. The note was intended to convey that the equivalent of 2,000 cubic feet of coal gas could thus be stored. This follows from the fact that Snelling gas has a calorific power somewhat over four times that of ordinary coal gas. As commercially prepared, the gas consists chemically of about 50 per cent of liquid ethane, 40 per cent of liquid propane, and 10 per cent of liquid butane. It is obtained from "wet" natural gas by compression and rectification. The rectification operates on a principle based on selected condensation on coils heated intermediate between the critical temperatures of the gases present, the operation being conducted under a pressure of about 1,000 pounds per square inch.

Aeronautics

Wilbur Wright's Illness.—We note with regret the sudden illness of Wilbur Wright. The elder of the two brothers who gave to the world the modern aeroplane has been stricken with typhoid fever and he was consequently unable to attend the Aero Show in New York or the first banquet of the Aeronautical Manufacturers Association held on May 16th.

Aeroplanes for the Italian Government.—Probably inspired by the success attending the use of aeroplanes by the army in Tripoli, a national movement has been set on foot in Italy to raise funds by popular subscription for building a fleet of 100 aeroplanes for the Italian government. The enterprise was launched on April 1st, and within one week $120,000 had been secured. The principal Italian cities have promised one or more aeroplanes each. Venice will furnish three. A newspaper in Milan has given $10,000 to the fund.

Gen. Allen's Flight in a Hydro-aeroplane.—On May 15th Brig. Gen. James Allen, Chief of the Signal Corps of the Army, was taken by C. C. Witmer in the Curtiss hydro-aeroplane for a flight in the vicinity of Governor's Island and the Statute of Liberty. The motor broke down after a short flight had been made, but the General was enthusiastic about the water machine and believes that in the near future 120 hydro-aeroplanes will be purchased for coast defense work. If the bill now before Congress goes through he stated that our Army will be provided with 15 squadrons of aeroplanes containing 8 machines each, and with aviators and mechanics to pilot and care for them. There will be a total of 285 officers and 720 enlisted men. There will also be five training schools for the instruction of new pilots, and Gen. Allen believes there should be an auxiliary aviation school in every State. An appropriation of several million dollars will be required, with a million dollars a year for maintenance of the aeronautic corps. At the present time we have but ten officers, a dozen machines, and one training school, at College Park, Md.

A Novel Helicopter.—Messrs. Papin and Rouilly recently presented an account of a new helicopter to the Académie des Sciences. Their "gyropter," as they call it, is propelled by compressed air sent into the propeller so as to drive the latter by its escape from nozzles at the tips of the blades, about like the ancient aeolipyle or a rotating garden sprinkler. They claim that according to their tests the fault of other helicopters lies not in the great power needed, but in bad mechanical construction and multiple parts. What is unusual is that the propeller has but two blades, being imitated from the natural screw seen in the sycamore seed flyer. In the center of gyration is placed the car and its angle with reference to the propeller can be varied by the pilot. Should the compressed air fail, the gyropter automatically takes a gliding position and falls very slowly. Forward movement in the air when flying is obtained by slightly inclining the axis so that the propeller drives the machine and also sustains it. A revolving cylinder gasoline motor drives the air compressor which is in the shape of a blower mounted direct against the motor.

Recent Fatal Accidents Here and Abroad.—During the past week there were several fatal accidents in France, England, and America. May 13th was the fatal day in the case of two of these accidents, one in England and one in the United States. The former happened at Brooklands Aerodome. A young aviator, Mr. E. V. B. Fisher, was making a flight in a Flanders monoplane with Victor L. Mason, the one-time secretary of Elihu Root and Gen. Russell A. Alger, as passenger. The machine had made six circuits of the course and started to descend when suddenly it first slid to one side somewhat and then dove at a sharp angle to the ground. The final fall was from a height of 150 feet. The men were both thrown out of the machine and instantly killed, while the wreckage took fire immediately. Tom Sopwith, who was flying at the time in a Blériot monoplane, arrived first beside the burning machine. The accident seems to have been caused by the motor failing when the machine was making a turn. The accident in this country occurred at St. Louis when Raymond Wheeler, a student aviator, and Peter Glasser, another student, were making a flight at St. Louis in a treacherous wind. The machine struck a telegraph pole while making a sudden descent and dropped 20 feet to the ground with terrific impact. The wreckage caught fire but the spectators were able to drag the injured men from beneath it before they were burned. Wheeler died within a few hours from the results of his injuries, and Glasser, whose arms and legs were fractured in addition to internal injuries, succumbed three days later. On May 14th Capt. Echeman, a French military aviator, fell 120 feet while flying in a monoplane at Etampes and was buried under the wreckage of his machine. He was removed to a hospital quickly, but his injuries were believed to be fatal. The failure of the motor was apparently to blame for the two worst accidents mentioned. Had the machines been equipped with an extra motor, as required in the Gould 2-motor contest, the accidents might have been avoided.

The New York Aero Show

Description of Some Novel American Aeroplanes on Exhibition

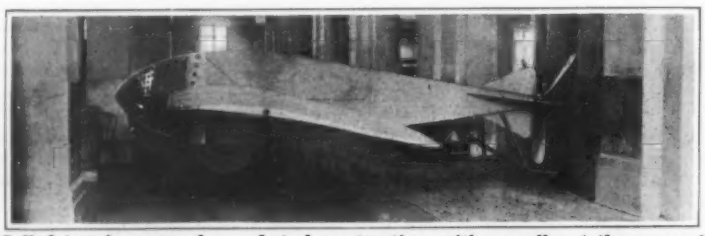
By Stanley Yale Beach

THE Aero Club of America's first Aeronautic Show to be held as a separate exhibition was carried on in the New Grand Central Palace from the 9th to the 18th inst. Although the number of aeroplanes shown was not very large, being in all about a score, there was a good representation of standard American machines, together with several new ones of somewhat freakish design, as well as a couple of standard French monoplanes—the Antoinette and the Nieuport.

Copies of the Blériot monoplane were shown by no less than three American manufacturers, one of the most interesting machines of this type being the Queen aero boat, designed by Mr. G. C. Loening. This machine, as can be seen from the illustration, consists of a Blériot monoplane surface, mounted above a fuselage and arranged to be driven by a propeller placed at the rear of the plane. The fuselage is covered with aluminium and pointed slightly at the front to form a boat. The aviator sits in a seat at the front end with his feet upon the tiller for warping the wings, and with his hands upon two horizontal levers that run back to a cross-piece mounted on a universal joint. By swinging the levers from side to side slightly, the vertical rudder is operated, while moving them up and down works the elevator. Both rudder and elevator are combined in the rear, so that they move together, this arrangement being similar to that employed by Santos Dumont on his "Demoiselle." The motor—a 50 horse-power Gnome—is placed in the body just below the rear of the plane and drives the propeller by a chain. Several tests have been made of this machine by its designer, who claims to have made a number of short straightaway flights.

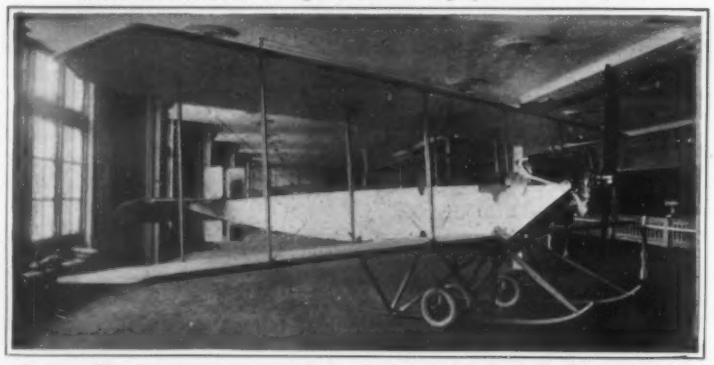
Besides the aero boat, the Queen Company exhibited a Blériot type monoplane with a 3-cylinder Anzani motor, in addition to a fuselage and uncovered wing. Another Blériot-type monoplane was shown by the National Aero Company of Woodhaven, L. I. This machine was fitted with a 4-cylinder air-cooled motor, known as the "Gray Eagle." Its construction was good, the design following closely that of the standard Blériot. A 6-cylinder motor of the same make was exhibited beside the machine. A third Blériot-type monoplane was exhibited by the Rex Monoplane Company of Staten Island. This machine has a Nieuport-type undercarriage with a single skid. The body was without a motor, though intended to be fitted with a 4-cylinder Kirkham motor. The front of the machine was well closed in with sheet aluminium, the pilot being thoroughly protected from oil.

One of the most interesting machines that caught the eye of the visitor as he entered the hall was a short, blunt-nosed monoplane with a high fuselage (4 feet square) and a perforated aluminium cap on its front end. The wheels were two-thirds hidden in the covered body and the propeller—a small three-bladed screw—was at the rear end of the latter. It is visible in the top photograph, in which can also be seen the triangular movable fins that form the elevator and the vertical rudder. The machine is so perfectly balanced upon its wings that no tail whatever is needed. This monoplane was built by the Gallade Engineering Co. of Norwich, Conn. Mr. Gallade is a licensed Nieuport monoplane pilot. He has endeavored to design a machine with the proper stream line form of body, as well as to reduce the head resistance as much as possible, and he has succeeded very well. The guys of steel cable are attached to the bottom of the fuselage only,

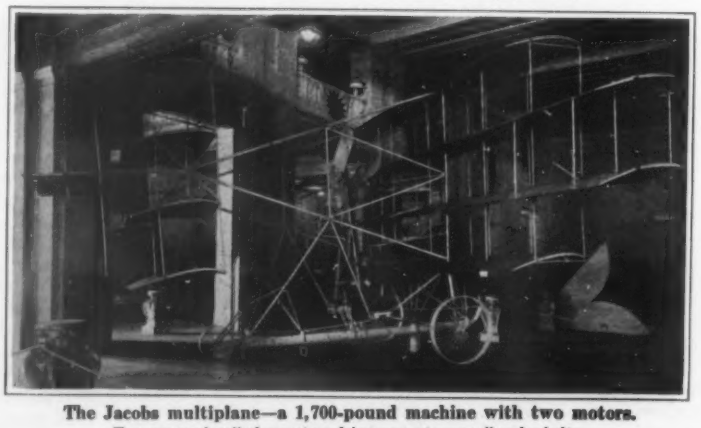


Galladet racing monoplane, of steel construction, with propeller at the rear end.
100 H. P., 14-cylinder Gnome motor in front drives the propeller through a long shaft.

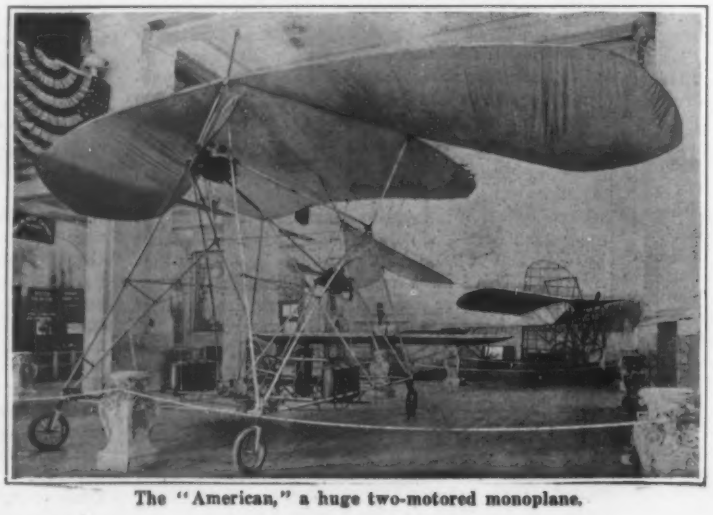
The "Queen" aero boat—The first American hydro-monoplane.
Note float beneath end of wing and chain-driven propeller behind the plane.



Burgess-Wright tractor-screw military biplane with 60 H. P. Renault motor.
First big American biplane with covered monoplane body.



The Jacobs multiplane—a 1,700-pound machine with two motors.
Two opposed cylinder motors drive separate propellers by belts.



The "American," a huge two-motored monoplane.

and they make a very acute angle with the wings. The wings are built up upon a 3½-inch steel tube that extends across nearly to the end of each wing. There is no visible means of warping, although this is accomplished by rocking the end ribs of each wing upon the main spar by means of internal mechanism. The rear spars can be moved up and down slightly while in flight in order to change the angle of incidence. The pilot is almost totally inclosed in the body, only his head projecting. The machine is 21 feet long by 32 feet spread; it has 205 square feet of surface for a weight of 900 pounds. The wings are 8 feet wide, with a 2-inch camber at the body, while 56 inches out they begin to taper and reduce to 6 feet width at the tip. The length of each is 14 feet. This machine has made short flights and it will travel nearly 100 miles an hour.

Beside the Galladet monoplane occupying the central space in front of the main entrance, was the exhibit of the Curtiss Aeroplane Company, consisting of a small headless racer of 21¼-foot spread by 4½-foot width of planes and having a total weight of 830 pounds. This machine was equipped with the regular Curtiss 8-cylinder, 75 horse-power, V-type motor which is said to drive it at about 80 miles an hour. The model D hydro-aeroplane has a four-foot greater spread, and this machine, driven by Robinson in France a couple of months ago, traveled at the rate of 73.3 miles an hour above a circular course. Therefore it would seem that the estimate of 80 miles per hour for the new racer is a conservative one. A second machine exhibited by Curtiss was a naval hydro-aeroplane with double control. This machine is practically the same as that used by Lieuts. Ellyson and Towers last fall and throughout the winter at San Diego. It has 28 × 5-foot planes and a weight of 960 pounds complete. A headless military aeroplane with double control was also exhibited. Sample Curtiss 4 and 8-cylinder motors were also exhibited. These weigh, respectively, 160 and 280 pounds compiete and develop 40 and 75 horse-power. The bore and stroke are 4 and 5 inches. The latter motor is said to have developed 86 horse-power in an official test made by the military authorities in France.

At the left of the front entrance, the Wright Company displayed a hydroplane float with multiple steps and their new 6-cylinder aeroplane motor. This engine is somewhat neater in appearance than the regular 4-cylinder. The latest Wright military biplane exhibited has a few minor modifications such as the placing of the radiator at the rear of the planes, the fitting of duplicate levers for both pilots, so that the warping lever can always be held in the right hand, and the mounting of two narrow vertical fins about 6 feet high at the front end of the short upturned skids in place of the small fins used heretofore. Frank Coffyn's Wright hydro-aeroplane, which was the first Wright machine of this kind, was exhibited in the gallery. The Burgess-Wright Company showed a hydro-aeroplane and a small biplane with single skid and no wheels, designed and built by A. M. Herring over two years ago. The chief exhibit of this company was the biplane with long covered fuselage shown in one of our photographs. This machine was fitted with an 8-cylinder V-type Renault air-cooled motor of 60 horse-power. It is also equipped with Wright control levers in the body as well as with a wireless telegraph outfit. The pas-

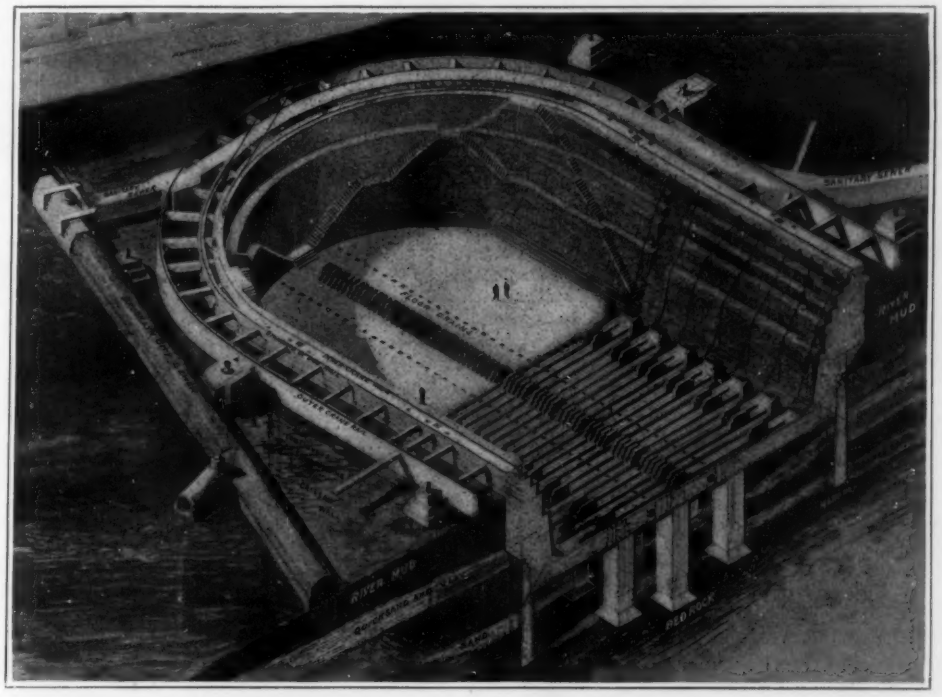
(Continued on page 483.)

Opening of the Naval Drydock, New York

Unique Methods in Constructing an Unusually Difficult Engineering Work

THE recent docking of our latest dreadnought, the "Utah," in drydock No. 4 at the Brooklyn navy yard, New York, marked the successful completion of an engineering work of unusual difficulty, the planning and construction of which called both for novel applications of existing methods and the development of others that are entirely new. The subsoil at the Brooklyn navy yard is notoriously unstable. The surface is largely underlaid with treacherous quicksand, and the records of previous dock construction bear testimony to the difficulties which have arisen from this cause.

On June 7th, 1900, Congress appropriated $1,000,000 for the construction of a concrete and granite drydock. On February 7th, 1905, a contract was awarded to George B. Spearin for the construction of a dock 554 feet in length, capable of taking a ship 506 feet long and 91 feet beam. Spearin began the construction, planning to surround the work with steel sheet piling and make a large open excavation for the entire dock. He encountered shifting sands and finally abandoned the work. On April 14th, 1908, a contract was let to the Williams Engineering Company. The dock was increased in size to 620 feet over all. This contractor also encountered the same difficulties due to shifting quicksand and subsoil conditions. On October 1st, 1909, after he had practically abandoned the work, the contract was canceled. The work was then re-advertised and five construction companies of well-known financial strength and experience were invited to bid. On November 13th, 1909, award was made to the Holbrook, Cabot & Rollins Corporation, their bid being $1,389,000. Shortly after this, the officer just detailed in charge of this work, Civil Engineer Frederic R. Harris, U. S. Navy, reported to the Navy Department that in his opinion it was not feasible to build the dock on the old plan and recommended a new type of construction embodying the use of pneumatic caissons. This plan was adopted and occasion was also taken to increase the size of the dock, making it 726 feet over all, and of the same width, 110 feet, as the Panama canal locks.



The site of the dock was underlaid by a bed of treacherous quicksand. The plan of construction was to sink the outer wall of the dock to bedrock and carry the floor upon lines of massive piers carried down to the same firm bottom.

Sectional, perspective view of the new drydock at the Brooklyn navy yard.

Opening of the new drydock at the Brooklyn yard, by the docking of our latest battleship the "Utah."

The ultimate successful completion of the work is undoubtedly due to the adoption of the novel and somewhat radical plan of drydock construction designed by Mr. Harris and to the energy and resourcefulness of Mr. Fred Holbrook, general manager of the Holbrook, Cabot & Rollins Corporation, who was personally in charge of the work for his company. On account of the Navy Department's urgent need of this dock for docking ships of the super-dreadnought type, the government engineer had to prepare the plans while the work of carrying them out was actually in progress. As a consequence, through the coöperation of Mr. Harris and Mr. Holbrook, the design evolved provided for the completed work with due regard to the various methods involved in the work of construction, the contractor and engineer apparently having worked in harmony for a single end, a condition not always met with.

One of the first steps under the third contract, was to take a complete set of borings over the entire site. The wisdom of this course was soon evident. Material that had been reported as rock at a distance of about 80 feet down was found to be merely large boulders; ledge rock was finally encountered at the head of the dock at a distance of approximately 95 feet from the surface. About 100 feet farther from the head, rock was still encountered but more than 100 feet from the surface, and at the entrance, although the borings went to 150 feet, the ledge of rock was lost, showing that the rock shelved off and was beyond the depth possible by pneumatic work. The plan then under way was to surround the structure by a reinforced concrete wall, sunk deep enough to penetrate the quicksand soils and seal this wall on the rock, thus confining the interior soil and making it a good foundation material. It became immediately evident that this plan could not be followed out. Up to that time, the plans under which the construction had been attempted contemplated a heavy masonry structure resting on piles, the interior or floor being an inverted arch, the thrust of which was taken by the side walls of the dock. This inverted arch was to resist the upward hydrostatic pressure of water when the dock is pumped out. The floor itself was designed of about 17 feet thickness; but it was not of sufficient weight in itself to overcome this upward tendency, and it had to transmit the excess upward thrust to the side walls, which had sufficient weight to counterbalance the tendency of the entire structure to float. To provide for this heavy floor arch, a very deep excavation was required into the quicksand soil blanket which overlay a water-bearing coarser sand below. The borings indicated that excavating so deeply into this, would mean that the ground and bay water, under a heavy head in this water-bearing coarser gravel, would boil up through the quicksand soil blanket and make the dock impossible of construction, both because the pumping out of such an excavation would be extremely difficult and especially because the pumping out would entail pumping water mixed with this very fine sand, and this would mean the removal of the soil support from below the foundations of some of the most important buildings in the navy yard. This trouble was actually encountered under the previous contracts when it was attempted to follow out this original plan. An important machine shop in the yard settled and collapsed and one of the large trunk line sewers of Brooklyn running through the yard near the site of the dock also collapsed and flooded the site of the work with Brooklyn sewage. This feature was accentuated by the necessity of driving the foundation piles for the center of the dock through the quicksand blanket. It was finally decided to surround the site of the dock with walls sunk in caisson to rock or hardpan, and where rock was too deep, to employ the pneumatic method to a sufficient depth to provide a water cut-off wall and insure a good foundation. This was made possible by the fact that at about 85 to 95 feet below the surface a coarser sand and some gravel was encountered.

The piles originally proposed for the interior of the dock were done away with and piers substituted, these piers also being sunk by the pneumatic caisson process. The depth of excavation was decreased from 57 to 51 feet, avoiding the removal of 6 feet of the quicksand

blanket material. It was possible to make this change and still increase the actual available depth of the dock for docking purposes by entirely changing the plans, so that the structure, instead of being a heavy inverted arch, became a comparatively shallow, reinforced, concrete floor slab, supported on piers spaced 20 feet center to center longitudinally, and 24 feet center to center transversely. The piers were arranged in three lines, one on the center line of the dock and one on each side; so that, with a ship in drydock, the weight of the ship was taken directly on the piers.

The piers served the further purpose of anchoring down the center of the dock against the tendency to push upward or rise from hydrostatic pressure. To accomplish this, the piers, which were each 7 feet square, were flared out at the footing to 11 feet square. The depth to which these piers were sunk was variable, depending upon the character of the material, although in each case a minimum depth had to be set, as the center line of piers had to provide an anchorage of 1,000,000 pounds to each pier, and the two side lines each an anchorage of 800,000 pounds to a pier.

The floor of the drydock proper was 8 feet thick and was reinforced at the top and bottom by twisted rods, 3.8 square inches section being provided at both top and bottom, to each running foot length of the dock. Rods on both sides were necessary because a drydock is subjected to a complete reversal of stresses. The dock ordinarily, when pumped dry, without a ship in it, has an upward tendency due to the water pressure beneath the floor; when pumped dry with a ship in, the dock has this same tendency and a downward tendency due to the weight of the ship on the keel blocks and on the docking keel blocks; and when flooded with water, it has a downward tendency due to the weight of the water contained and the weight of the structure itself.

The cut-off wall, which surrounded the entire structure, was also reinforced by steel rail, 60-lb. section, spaced 2 feet centers on the outside and 8 feet centers in the interior. This cut-off wall was sunk in caissons, each 36 feet long and 5 feet wide, provided with half round joints at each end. These half round joints were subsequently excavated and filled with concrete under air pressure. At the head of the drydock, the walls were placed in an arch form and were made 7 feet thick, the design of the dock contemplating a comparatively thin horizontal arch at this end of the work. At the entrance of the dock a double cut-off wall was placed, the two cut-offs being 40 feet center to center; the design was also drawn with a view to adapting the permanent work to construction purposes, the cut-off wall serving the same purpose as sheet piling in trench work, as the borings made on the site of the dock indicated that it would be impossible to use sheet piling on account of the many boulders interspersed in the quicksand soils. The caisson work, especially of the interior pillars or anchors, was extremely difficult on account of the blasting necessary to carry them through the boulders embedded in the quicksand soil, while the caisson work on the surrounding cut-off was also most difficult and unusual as, in instances, the steel sheet piling driven by the former contractors was encountered at some distance from the location set for this wall, in one instance, 20 feet; it had twisted and drifted so in driving from its original location that it was encountered in the working chamber of the caisson. This difficulty was overcome by burning off the steel sheet piling by oxy-acetylene torches.

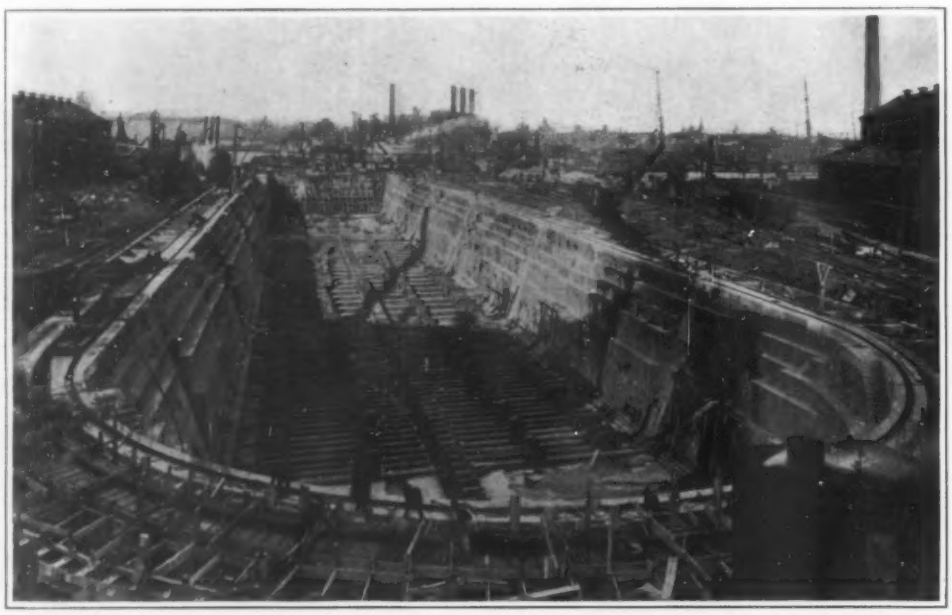
The method of constructing the dock proper, after the caisson work had been completed, was to excavate in between cut-off walls to a distance of 10 or 12 feet above subgrade and then shore entirely across the site from cut-off wall to cut-off wall, the shores consisting of a strut made up of four 12 by 12-inch timbers latticed together. These trusses were placed about 20 feet apart along the length of the dock and in numerous instances three tiers of such braces were placed. These braces in turn were braced longitudinally and sway-braced at intervals. The excavation was then carried to subgrade, the first plan being to excavate for a width of 20 feet longitudinally entirely across the dock, and then place the reinforced concrete floor, alternating the excavating and placing of the floor and removal of the braces. The cut-off wall, however, was so effective that it was later found possible to open wider stretches of floor than this, and in one case a piece of floor 45 feet in length was placed in 26 hours, involving the placing of nearly 1,700 cubic yards of concrete, with one concrete mixer.

After the entire floor had been placed, pumping was still continued through two holes left in the floor so as to relieve the floor of all water pressure. The side walls were then built on top of the floor and bonded into the cut-off walls which then became the foundations for the side walls of the dock. After these walls had been carried to a sufficient height to insure the proper holding-down weight, the holes in the floor were grouted up. Pressure gages attached to pipes running through the floor very soon indicated that the calculated hydrostatic pressure was present below the floor.

The method of constructing the entrance of the dock was that the two cut-off walls previously referred to were arranged so that the concrete placed in these caissons extended up high enough, so that when set in place this concrete was below subgrade, the caisson above concrete consisting of lagging with a sand and pig iron filling. On the outer cut-off wall the outside portion of the caisson consisted of 16-inch thick double tongued and grooved timber, lighter 3-inch lagging being used on the interior, and on the interior cut-off wall 6-inch tongued and grooved timber was used on the outside of the caisson and lighter lagging on the interior. The earth was then excavated in between the two cut-off walls, the interior light lagging being cut out, and, as the excavation progressed, shores were placed across the excavation from the 16-inch timbers to the 6-inch timbers abutting against I-beam wales previously provided before the sinking had started. The excavation was carried to subgrade in this manner, it being also necessary to shore transversely across the dock from cut-off wall to cut-off wall, leaving square pockets between the timber work for the removal of the excavation. When subgrade had been reached, the entire dock structure at the entrance, for a distance of 40 feet between this timbering, was built in this cofferdam, the two granite gate seats also being set. The horizontal braces were then replaced by raking braces to the two gate seats and wedged up, and then the interior 6-inch lagging was removed and the inboard body of the dock excavated up to the section of the dock completed at the entrance and bonded to it.

The drydock is provided with a float gate caisson of the hydrometer type. The dock is pumped out by three vertical-shaft, motor-driven, volute pumps, having 54-inch suctions and 48-inch discharges, each designed to deliver about 9,000 cubic feet per minute under the maximum head, and it is also provided with two 15-inch vertical shaft motor-driven drainage pumps. The water in the dock is led to these pumps by two 3-feet diameter culverts running the entire length of the dock, and also by four large gratings at the foot of the pump well, these leading into a forebay directly in front of the suction of the pumps, water discharging from the pumps directly into a large discharge chamber located directly over the forebay, from which the discharge water emerges through the discharge culvert 10 feet in width and 15 feet in depth. The pump well itself, with the exception of a small entrance house, is entirely below the coping of the dock, and is in the same manner as the dock surrounded by a cut-off wall sunk in caisson. The dock is provided with salt water for flushing and fire purposes, fresh water, compressed air, electric current for ship lighting, driving of capstans, of which seven are provided, with standard gage railroad tracks for locomotive cranes and also with special 18-foot gage crane tracks for 40-ton cranes.

The work involved the doing of 32,000 cubic yards of caisson work and the placing of approximately 60,000 cubic yards of concrete and 4,000,000 pounds of reinforcing steel. The drydock is lined with vitrified paving brick, with granite coping, abutment, and gate seat. Its cost has been about $3,000,000. While the first appropriation for the work was made twelve years ago, and the construction has been in progress over seven years, since the work done under the previous plan and earlier contractors was a detriment instead of being an assistance in the present construction, the actual time consumed in the construction of the new dock has been slightly less than two years and six months. Considering the unusual difficulties and the fact that over a year of this time was spent in the caisson foundation work, this is a record in rapid drydock construction.



Length, 726 feet; breadth, 110 feet; total amount of concrete, 60,000 cubic yards; re-enforcing steel, 2,000 tons.

Construction of the drydock, Brooklyn navy yard.

The Introduction of the Famous Nammu Tree of China

THE nammu tree (*Persea nam-mu* Oliver) of the laurel family of plants yields the most valuable wood of China. It grows in the moist climate of western Szechuan, China, which lies between the 25th and 26th degrees north latitude. This is in about the latitude of New Orleans, and attempts are now being made to grow this valuable tree in this country. The first introduction of the seed has been so recent that it is impossible to say definitely as to what part of the country it is most likely to succeed best, but the very moist climate of Szechuan indicates that a considerable degree of humidity will be required. It is hoped that the tree can be acclimated and grown along the Gulf coast and in Florida generally.

In mature condition it is a tree from 100 to 125 feet in height and from 4 to 6 feet in diameter at the base. The nammu tree grows very slowly and it does not promise to be a profitable tree for planting when quick returns are desired, but it would serve as an ornamental tree of exceptional beauty. The wood is of extraordinarily good quality and is used extensively for a great variety of special purposes. It furnishes the most highly prized wood used by the Chinese. The wood is beautiful when polished, warps and shrinks very little in seasoning, and is said to be the most durable wood in the country. It is soft, strong, dark olive-brown, aromatic, and has exceedingly small pores and very fine medullary rays. The famous nammu tree is now comparatively rare and is so highly valued and esteemed that its wood is used only for interior finish for the chief imperial palaces throughout China. The coffins of the rich are usually made of this wood.

A Point of Diction

MANY a sigh has the Editor heaved over the continually recurring phrase, "Due to," used often by well informed and instructive writers, as a conjunction, whereas its use should of course be restricted to adjectival expressions. It is therefore with a peculiar pleasure that we note a letter addressed to the Editor of *Science*, which is quoted at length below:

"To the Editor of *Science:* 'Due to the death of my imaginary stenographer, I am able to write you but a few lines.' This is a quotation from any one of several hundred scientific contributions that I have read lately. The object of my writing now, Mr. Editor, is to ask of you (for the first time) a favor, and that is that you will refuse to print any communication in which the adjective 'due' appears in any way except as agreeing (I think that is the word) with some noun or pronoun. As I believe that one who does not do research himself may do good by suggesting subjects to others I suggest this: 'Which is the worse, the English of scientists or of politicians?' ARTHUR GORDON WEBSTER."

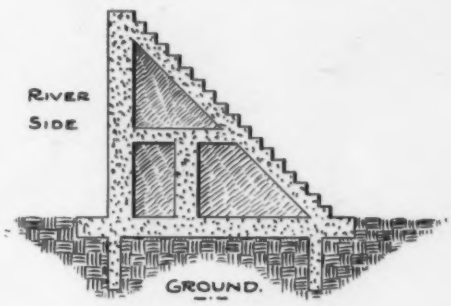
The Mississippi River

THE terrific floods of the Mississippi River now devastating millions of acres of the most fertile lands of these United States, rendering homeless thousands of her inhabitants, with great sacrifice of life and with irreparable financial loss, presents an engineering problem the gravity of which is not realized and is very little understood by the masses of our people.

Suffice it said that this great river for a distance of some 1,500 miles, from Cairo to the Gulf of Mexico, is confined within its channel during high water by means of an almost continuous chain of dikes or levees raised on either side. These levees are built of earth excavated from the soil adjacent and are sometimes of enormous proportions; in general, they are from 10 to 30 feet in height with a base from 80 to 200 feet in width and require from 20 to 100 cubic yards of earth to each linear foot. During low water, from July to December of each year, building of new levees and repair of the old takes place. Each State has the care and expense of its own levees, which run up to millions of dollars annually.

The levee system is about the most economical method of flood protection that can be devised but it is a makeshift at best. It answers fairly well for ordinary rises but for heavy waters it is a pronounced failure. The menaces to the system are too numerous, for aside from the doubtful permanent stability as regards the height, texture and general strength of these earthen embankments, they are attacked and rendered useless by crayfish, muskrats, king-fishers and countless boring insects and reptiles besides the dangers of currents, wave-wash, rains, and drift. When it is taken into consideration that these levees are built to protect from overflow some 40,000 square miles, say 25,000,000 acres, of the most fertile lands of the world, situated right in the heart of our great country and nursing a population of several millions, it is surprising to think that our common government persists in remaining inactive by not taking over to its care and expense this gigantic task and evolving a method of protection that will be permanent and satisfactory. There is no great work now occupying the attention of the Government more urgent or of greater magnitude, not even the Panama canal, than the successful diking of the great Mississippi in its lower valley. The financial requisites are too great to be saddled upon the States immediately bordering the stream; nor is it fair that Louisiana should bear the brunt of loosened waters from Pennsylvania or the Dakotas. It ought and should be by right a Federal charge, particularly as our great Government alone could procure the means to successfully undertake the task.

It must be remembered that the Government is now and has been for a number of years past, taking care of the natural channel of the Mississippi River by mattressing its banks to prevent erosion, by dredging in certain localities, building locks here and there and maintaining the jetties at its mouth, all with great success and with much praise due our army engineers to whom the work is entrusted. But the diking of the river will call for more complex engineering ability and our army engineers will no doubt meet the issue.



Proposed reinforced concrete dike for Mississippi river.

The question will naturally arise as to the system to be adopted: Whether the new dikes shall be constructed of earth, as at present, with regular guards located at specified distances apart along the entire line, not only during "high water," but the year around, their duties being to prevent the ravages of musk-rats, crayfish, etc., and to make immediate repairs wherever required; or whether these dikes, which have proven a failure time and time again, will give way to dikes constructed with a view to permanence and stability, behind which all will experience a sense of security and comfort?

The accompanying sketch of a re-inforced concrete dike may furnish a suggestion and may lead to something better; but this would have strength, durability and sufficient weight for its purpose and having the merit besides of being simple. Of course the initiatory cost of a concrete dike will be much greater than a levee, but in the end the concrete dike would be the most economical and the insurance slogan would be applicable: "Protection that protects." It will be noticed that the suggested form of dike is to be hollow wherever possible, thus saving in material and at the same time not impairing its strength.

The sketch shows a dike with an elevation of 20 feet above the ground, the base would be greater or less for a higher or lower dike in proportion; then again, all of these dikes would not require reinforcement. From an engineering standpoint, there is only one factor of weakness in this form of dike and that is the possible undermining or blowing out beneath the foundation at some point where the engineer carelessly overlooked a bad soil; wooden sheathing or a few sacks of earth thrown in on the river side would soon choke and stop any serious mischief from that source, therefore its only point of weakness is a mere bagatelle. However, there are numerous other ways the Mississippi River could be successfully diked. Some method should be adopted and put into execution at once and stop this almost annual visitation of death and destruction throughout the lower valley.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

The Gregorian Calendar

To the Editor of the SCIENTIFIC AMERICAN:

I have read the communication from Mr. Falbe in your issue of April 20th with more than usual interest. After some figuring the author arrives at the conclusion that the solar year will fall behind the calendar 344 minutes in a century. At this rate the solar year would fall behind the calendar one day in 418.6 years. I don't think that is quite right; although I may be in error. Let us see. There are 97 leap years in 400 years; (365 days × 400) + 97 = 146,097 calendar days in 400 years. The solar year contains 365 days 5 hours 48 minutes 46 seconds, or 365.2422 solar days. Multiply this by 400, and we have 146,096.88 solar days. Subtract this from 146,097 calendar days and we have 0.12 day; the difference between the calendar and the solar year in 400 years. As 0.12 day is to 1 day so is 400 years to 3,333 1/3 years. The error in the Gregorian calendar is one day in 3,333 years. Is this correct, Mr. Falbe, or anybody else? JOHN FORD.

Swedesboro, N. J.

Non-corroding Ink

To the Editor of the SCIENTIFIC AMERICAN:

In a recent issue you state under Notes for Inventors: "The Government wants good ink that will not corrode the pen and clog on the pen point." As an ink specialist I would like to say a few words that might be of more general interest.

The only ink that will give satisfaction is the so-called nutgall ink. The oldest formula given for it comes from the seventeenth century, but was known before that time. Certainly we have improved on it, but in its principle it is the same. Chemically it represents a solution of tannic and gallic acid, sulphate of iron, and sulphuric or hydrochloric acid. Naturally this will corrode steel, but so will plain water, and if it was just for the corrosion through the ink, pens could be used considerably longer than they are actually used.

The phenomenon usually mistaken for corrosion is the coating of the pen. This coating represents the solid matter dissolved in the ink, and its amount is proportional to the specific gravity of the fluid. The better grades of writing fluids contain the smallest amount possible and still have very good record qualities, and we hardly can hope for a great improvement in this direction.

The remedy must come from the user. The ink wells should be small and cleaned frequently. When not in use they should be covered, to keep the ink free from dust and avoid oxidation and subsequent precipitation. For the last reason the stock bottles should be kept in dark, cool places. Different inks must not be mixed. If ink gets thick, it should be thrown away. Pens should never be left in the ink well. If these precautions are taken and the pens wiped off at night, complaints about "corrosion" would be but few.

New York city. DR. H. BRUENING.

Magnetic and Electrostatic Attraction and Repulsion

To the Editor of the SCIENTIFIC AMERICAN:

The evidence that like magnetic poles of unequal strengths attract each other if brought closely together, suggested the possibility of a similar phenomenon in electrostatic attraction. The so-called "first law" of electrostatics, "like kinds of electricity repeal each other and unlike kinds attract," was the subject of investigation.

An electroscope was constructed by mounting two pith balls on the ends of a glass arm supported at the middle by a cap and needle. A vulcanite or glass rod, excited in the usual way by rubbing with flannel or fur, attracted the balls when brought near them, until they had accumulated a sufficient charge, when repulsion ensued. So far, the results harmonized with the above law.

However, when the rod was newly excited and made to approach one of these charged balls, repulsion took place until the rod came within a certain distance, when attraction resulted. As soon as the potential of the ball equaled that of the rod, it was again repelled. As the pith ball was practically a non-conductor, it was possible to partially lessen its charge by touching it with the finger. Upon again bringing the excited rod near it, repulsion and then attraction were observed as the distance decreased. However, when the potentials of the rod and ball were again equal, no attraction could be observed.

This is precisely analogous to the attraction of like poles in magnetism. If a steel knitting needle be notched at its center, magnetized, and broken, two similar magnets of practically equal strength are formed. These magnets will show no attraction between like poles; probably because their magnetic fields are of the same strength.

However, either pole will be attracted by the like pole of a stronger magnet, if brought near enough to it.

Hence, it would seem that magnetic and electrostatic attraction and repulsion are functions of the relative field strengths, as well as of kinds of poles or kinds of electricity. Moreover, the above analogy is simply another bit of evidence indicating that these various phenomena of attraction and repulsion are the same in kind, although differing in source.

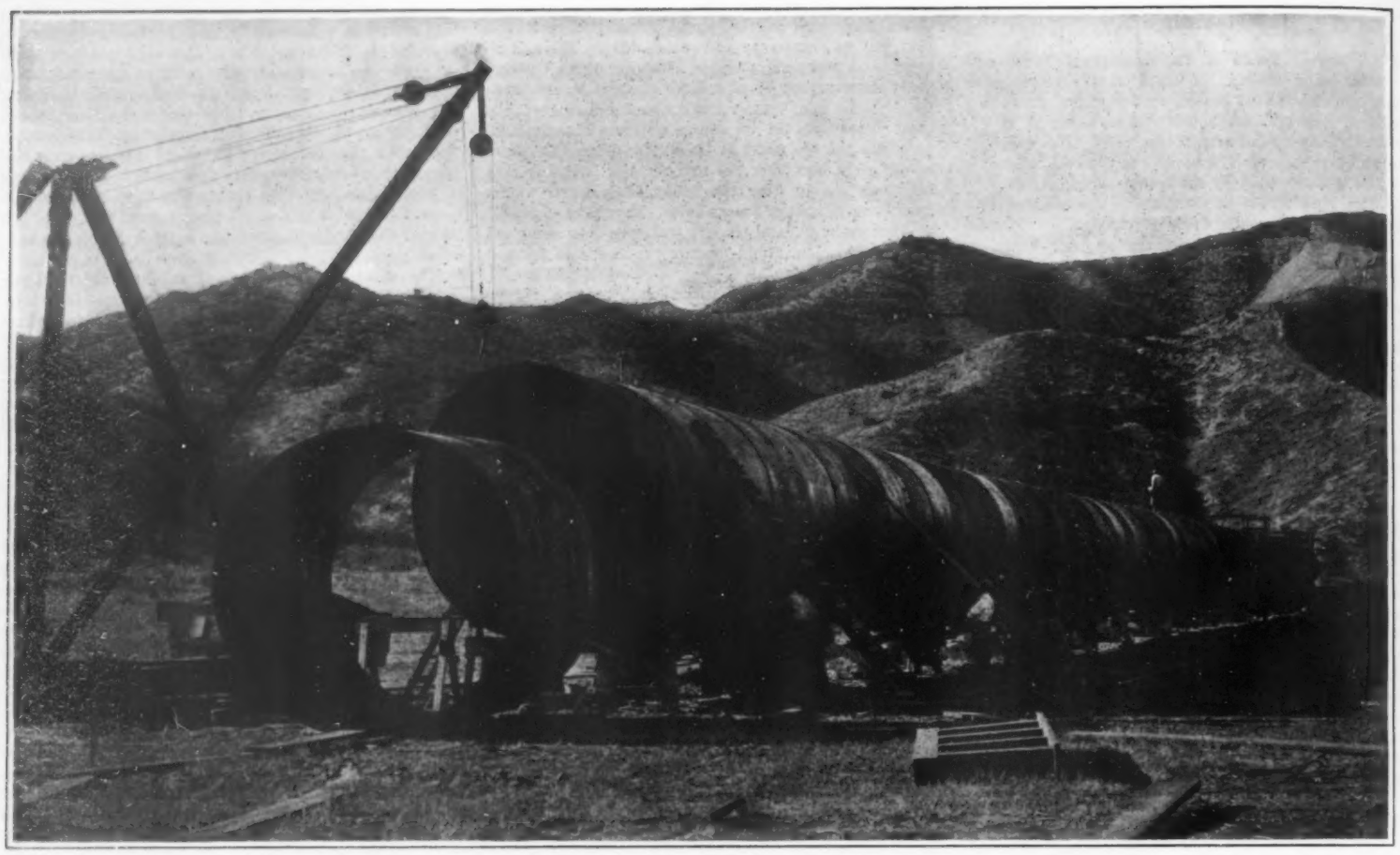
Lincoln, Ill. CHAUNCE C. KIPLINGER.

Method of Making Pulp Lumber

To the Editor of the SCIENTIFIC AMERICAN:

The following is a formula for making a pulp lumber, or board, that will answer every purpose of a plaster board, and is very inexpensive and easily made, and can be made by every one disposed to do for themselves. Plaster board is a very useful material in every home, but its sale is confined, largely to having to order from the factory and wait its coming, except in the larger cities, and this pulp lumber can be made by anybody and is less expensive than any plaster board. Plaster can be had in almost any town, and saw-dust can be had for the cartage. A mixture of 7 pounds of dry saw-dust to 100 pounds of gypsum stucco makes 3 square yards of pulp lumber 1 inch thick, and where the board is made thicker than one inch a greater per cent of saw-dust can be used. It can be made at a labor cost of 3 cents per square yard. Wood molds having adjustable sides and ends and a rubber-covered bottom so the plaster won't stick to the mold are very satisfactory and very cheap. It will dry in a few minutes, and until it can be taken out of the mold it should be stacked perpendicularly on edges so the air will pass under and between each board until it is dry. When dry it can be sawed, and holds nails very well; can be nailed on wood studs to form a wall; for a real cheap wall only the joints have to be pointed, and then it can be papered. It will prove a very inexpensive, air-tight and vermin-proof wall. Mix a little of the material, pour into a cigar box, let it dry, and you will be surprised at the results. It is a first-class material for inside purposes and within the reach of the poorest people, for they can make it themselves, as the plaster necessary for any one job would be a small item. When the public know how to make it, there will be thousands of unused attics converted into sanitary habitable living rooms, and many cold houses made warmer. It makes fine partitions, as there would not be the stains that occur from the use of wood lath, and it is much less expensive than lathing and plastering. It can be made two inches thick and set between wood studs and each side plastered and the result is a wall more sound and fire-resisting than the wall lath with wood lath and plastered, and an inexpensive test will show the great merits of this material, which is possible for every person to make. There is no selfish interest in this matter; it is simply the result of tests that the writer made with gypsum, and the result is such that he feels the public should know; and if you consider the information of value to the public I would be glad to have you publish it, but do not give the writer's name, as he is not seeking press notoriety. If desired, use the initials if a name is necessary to an article of this kind, all of which the writer is not familiar with. M. T. S.

Cleveland, O.



The Deadman siphon in process of erection.

An Aqueduct Two Hundred and Forty Miles Long

How Steel and Concrete Siphons will Supply Los Angeles with Water

By Burt A. Heinly

SIMULTANEOUSLY but on opposite sides of the continent, water works projects are under way such as have no parallel in history: The Catskill Mountain Aqueduct, ninety-two miles in length, which is to serve the metropolis of New York, and the Los Angeles Aqueduct, 240 miles long, to supply the city of Los Angeles.

Exclusive of the tunnel work of which there is forty-seven miles in the Los Angeles Aqueduct, probably the most interesting feature of this great enterprise by which the waters of the eastern face of the Sierra are to be carried around the western rim of the Mojave Desert, beneath the Sierra Madre Range and into the San Fernando Valley, north of the city, is the construction of twenty-two inverted steel siphons. It is by this means that the flow of the aqueduct will be borne across deep canyons and broad valleys. These huge steel pipes, with the exception of one of large diameter at Niagara Falls and a steel main imbedded in concrete near Madrid, Spain, are, so far as the writer knows, the largest in existence. They range in length from 611 to 15,596 feet, and in diameter from 8 feet 6 inches to 11 feet. The designs call for a minimum capacity of 430 second feet. Varying with the pressure, the thickness of the steel ranges from one-fourth inch to one and one-eighth inches.

Where the depressions are shallow and the head is light, as in the case of Whitney and Ellsmore canyons, siphons constructed of concrete, heavily reinforced with steel, are used—this because of the cheaper cost.

The aggregate length of the steel siphons of the Los Angeles Aqueduct is 49,576 feet, which, with the concrete siphon approaches and siphons composed entirely of reinforced concrete, brings the total footage of this class of construction to 63,585 feet.

The maximum head varies greatly, the lowest being 50 feet while that of the siphon crossing Jawbone Canyon amounts to 850 feet. This siphon, for which the steel is now being delivered, will have a total length of 8,095.51 feet, the pipe ranging in diameter from 10 feet to 7 feet 6 inches and the thickness of steel from a quarter of an inch to one and one eighth inches.

The aggregate tonnage of steel amounts to 14,500 tons. Loaded 40,000 pounds to the car, it requires 700 cars or 35 trains of 20 cars each to transport the material from Eastern steel factories to the various destinations along the Mojave Desert.

The longest siphon is that by which the waters of the aqueduct are borne across the upper reaches of the Antelope Valley, an arm of the Mojave desert lying along the northern base of the Sierra Madre range. This siphon at its northern end consists of a concrete pipe 10 feet in diameter, which sustains a maximum head of 75 feet, 15,596 feet of steel pipe 10 feet in diameter with plates one quarter to three eighths inches in thickness, constructed for a head of 200 feet, and 3,414 feet of 10-foot concrete pipe at the southern end for a head of 75 feet. All this work is being done 35 miles from the nearest railroad.

At the lowest point in the siphon, two 24-inch double-disk Rensselaer gate valves were installed. These valves placed over the lowermost pier to insure stability when open, obviously are used for cleaning purposes; but their most important function at first sight may not be apparent. For long distances the aqueduct follows the contour of the steep mountain side at an elevation ranging from 800 to 1,200 feet above the floor of the desert. Damage to the aqueduct from slides or other causes would be largely increased by the after effect of 20,000 miner's inches of water let loose on a steep gradient. These gates will therefore serve, in case of accident, to divert the flow of the aqueduct into the natural channels of the canyons where the hydraulic force will be without disastrous consequences. The Nine Mile siphon exclusive of the piers was completed at a cost of $18.47 per linear foot. This is at the rate of $5.18 per hundredweight which it is estimated is $1 per hundredweight cheaper than the work could have been done by contract. The work on the siphon across Soledad Canyon is being done somewhat cheaper than this. Here two sections are riveted together and the 12-foot length is then hoisted by a giant crane into its proper position in the siphon.

The completion of the aqueduct, unless unforeseen financial delays should intervene, will be accomplished during the early months of the year 1913 at a total cost of $24,500,000, and it is expected that the siphon work will be in place by November of this year.

One of the huge steel siphons of the Los Angeles aqueduct.

Taking Moving Pictures Upon Glass Plates

By the London Correspondent of the Scientific American

ALTHOUGH the perfection of the celluloid film gave us the moving picture, it presented great difficulties. The flexible fabric is inflammable, and in the majority of countries, this feature has rendered the enaction of special laws governing the display of animated photographs a necessity, in the interests of the welfare of the community.

Realizing these drawbacks, a well-known French inventor, M. Georges Bettini, devoted his energies to an apparently hopeless idea—the recording and projection of movement by means of glass plates. He has evolved a process which brings kinematography within reach of the amateur photographer, at the minimum of expense.

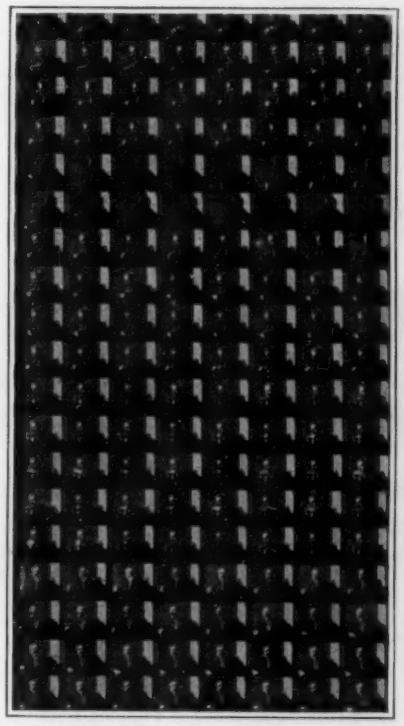
The Bettini apparatus is described as *Cinema à plaque*, which indicates the idea in a very adequate manner. It is no more cumbersome than the ordinary snap-shot camera, its mechanism is of the simplest description, its manipulation is quite as easy, and the same mechanism suffices both for taking and projecting, the only additional requisite in the latter task being an ordinary projecting lantern. The pictures are recorded upon glass plates measuring 13 x 21 inches, each sensitized glazed surface carrying not one, but 576 pictures, equal to one minute in projection. Moreover, the mechanism is so designed that as many plates can be slipped into position in succession as may be required, according to the length of the subject photographed, so that an absolutely continuous record of the action photographed is secured, just as completely and as easily as if celluloid films were used.

The ordinary cinematograph camera using films demands somewhat complicated mechanism, and as is well known, a certain amount of vibration is set up in its operation, no matter how carefully the mechanical action may be balanced. The fundamental principle is the movement of the film past the lens, the displacement of the latter taking place intermittently, and at regular intervals, while the lens is closed by the shutter.

In the Bettini camera the principle is diametrically opposite. A special optical system has been devised which has the feature of being light in weight, and this constitutes the moving part, the sensitized glass plate being held fixed or rigid. As may be seen from the accompanying photograph the pictures, of very minute dimensions, are recorded upon the plate in a series of transverse rows, in the same way as the lines of type in a newspaper or book. Though the photographs are extremely small they are strikingly clear and sharp in every detail, so that when thrown upon the screen in projection they stand out as clearly and as steadily as an ordinary lantern slide.

It follows as a matter of course, if in taking the photographs the objective is displaced to secure the successive views in continuous action, that in the projection of the pictures a similar displacement must ensue in order to permit the objective to be followed. The solution of this problem constituted the *crux* of the whole matter, and the inventor has devised an ingenious means whereby the objective alone is moved without demanding any displacement in the projection.

The principle upon which this result is obtained is explained in the accompanying diagram. *A* is the photographic plate carrying the rows of images. The photographs are illumined from a fixed light *B*, the rays of which are parallel to the plane of the plate, instead of striking the images at right angles as in the ordinary projector where the film is moved vertically. The rays of light fall on a prism *C*, which deflects them at right angles, so that they fall vertically upon the plate, passing through the picture. On the opposite side of the plate is the objective *D* with which is combined another prism *E*, so that the light rays after traversing the image on the plate and the objective are deflected once more at right angles to the primitive direction and are thrown upon the white wall *F*.



A portion of a 575 photograph film taken by the Bettini apparatus upon a sensitized glass plate.

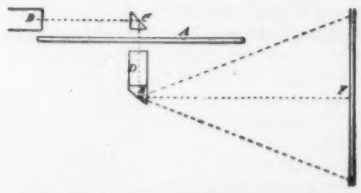
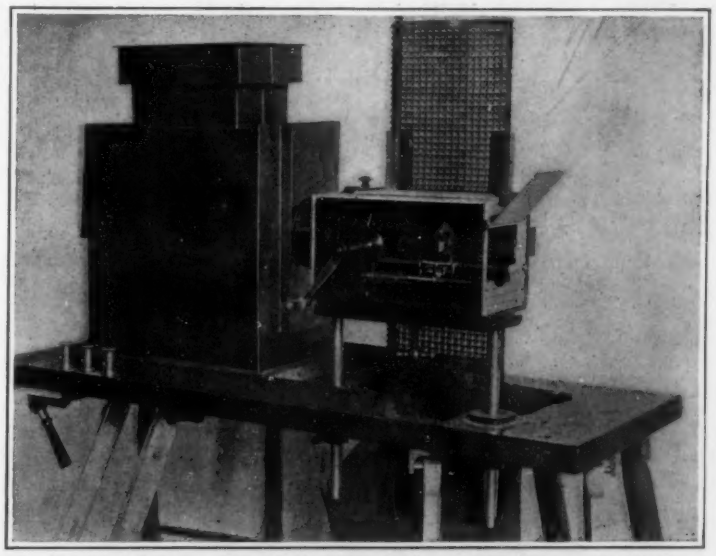


Diagram showing relative position of the plate and the moving objective.



The Bettini "cinema a plaque," showing attachment of ordinary optical lantern.

In projection, the prism *C*, objective *D*, and prism *E* are moved synchronously by an ingenious movement from picture to picture along the row of images on the plate, the latter thus being held stationary, while the light is intermittently cut off as the objective and prisms are moved from one picture to the next. When the moving mechanism has reached the end of the line the plate is moved forward the depth of a row of pictures, thereby bringing the succeeding line of images before the objective.

The mechanism is extremely simple. The same apparatus is used for both photographing and projecting, it being only necessary to acquire an ordinary optical lantern for the latter purpose.

Briquetting Iron and Metallic Waste

By Our English Correspondent

AN Austrian inventor, however, Mr. Arpad Ronay of Buda Pesth, has recently perfected and patented a process for briquetting mineral wastes without a binder.

Mr. Ronay applies enormous pressure to the particles, but the application is slow, so that the individual particles may associate and come together to permit of the exclusion of air and water. This process is followed by nature in the production of rock deposits, the fine particles of disintegrated rock being pressed together to come into close contact with one another, moisture being driven out slowly, until at last the mass becomes homogeneous and forms solid stone.

No binding material whatever is employed; neither is heat. The process is cold throughout. Certain efforts to achieve a similar end were attended with failure owing to pockets of air forming in the mass, and naturally the presence of this compressed element broke up the briquette. Mr. Ronay however has solved this difficulty completely, inasmuch as the air is permitted to escape.

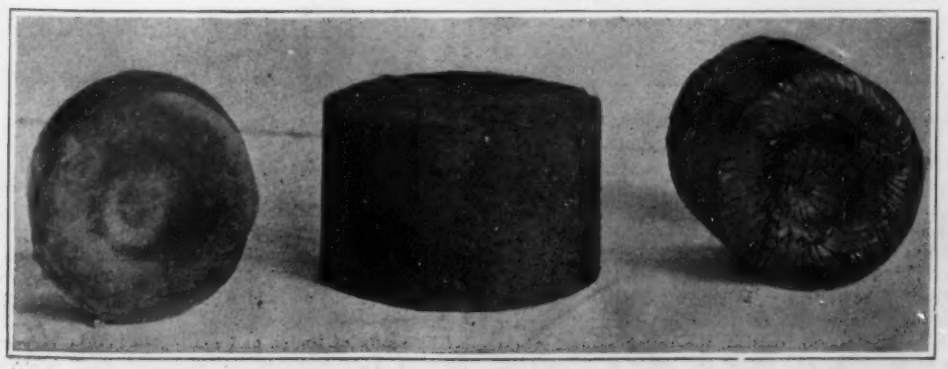
The fragments of metal such as turnings, chips, filings and so forth, are delivered into a large hopper which feed the hydraulic press.

When the metallic waste has gravitated into the hydraulic press the plunger descends and slowly, but steadily, the mass is subjected to increasing pressure. By carrying out the task slowly the air displaced by the particles being forced gradually into closer contact with one another, can effect its escape. The result after this first treatment is completed is that shown in our illustration, where the leaves of the waste material are observed to be curled into one another. The briquette is then submitted to further compression which combines the particles more tightly together and this final pressing is continued until a pressure of some 2,000 atmospheres is attained which converts the metal into a semi-plastic condition.

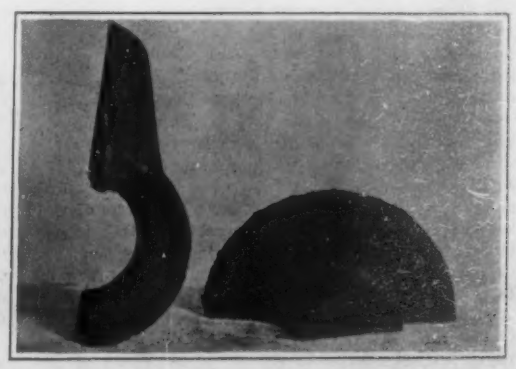
Briquettes made by this method from cast iron borings with a low percentage of phosphorous, can be substituted advantageously for the white iron as used in tempering furnaces, while Bessemer plants and steel foundries having Siemens-Martin furnaces using scrap material, find briquettes made from steel and wrought iron turnings a cheaper and more efficient fluxing medium.

Over a dozen plants have been erected in Germany alone for briquetting waste materials according to Ronay process, the largest being that built for the Tegel works of Borsig, Germany's largest railway manufacturer. The Tegel plant has a capacity of six tons an hour.

In the Ronay process all metallic waste is treated with equal success, a matter of some importance when the more expensive metals, such as bronze, brass, and aluminium, are considered. The losses from oxidation, which were very heavy under previous methods, are wonderfully reduced.



Briquettes pressed from metal waste. Successive stages of the work shown from right to left.



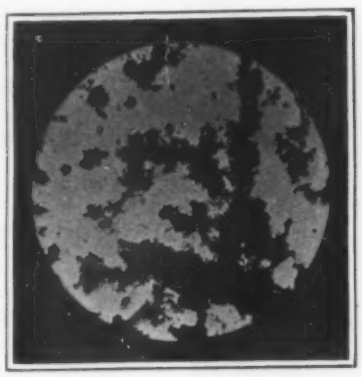
Drop-forging made from a briquette of wrought-iron borings.

Diamonds from Illuminating Gas

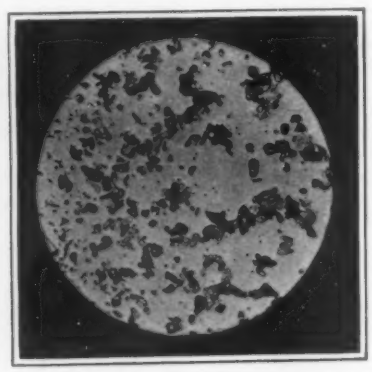
As diamond is only a variety of carbon, it would in principle seem quite feasible to produce this precious stuff by artificial means. In fact, the French physicist Moissan in his famous experiment obtained some minute crystals of it by causing the carbon contained in molten iron to precipitate under enormous pressure. But that diamond crystals can be derived from lighting gas will at first sight seem incredible to most readers. Still, at a recent congress of the German Bunsen Society, Dr. W. von Bolton drew attention to the decomposition undergone by carbon compounds, such as lighting gas, under the action of mercury vapors. Sodium amalgam was for instance shown to decompose this gas into its elements, separating the carbon both in the form of black coal and, it seemed, of diamond. As, however, the quantity of material thus obtained was too small to allow of any analysis, Dr. von Bolton recently endeavored to obtain greater quantities by causing the diamond crystals to grow on some mother substance.

To this effect 50 grammes of 14 per cent sodium amalgam were introduced into a long testing tube. After having coated the upper layer with a diluted water-glass solution, a mainly amorphous diamond powder was spread over it. The testing tube was then kept at a temperature of 100 deg. Cent. in the water bath, after which a slow current of moistened lighting gas was introduced. After one month's action of the mercury vapor given off by the amalgam, very little black carbon had been separated, while on the layer covered with diamond powder a number of particles of higher brilliancy were noted. Any amorphous diamond powder having been removed by scratching, the contents of the testing tube were boiled in a platinum crucible with a mixture of fluoric and sulphuric acids. Inspection under the microscope then showed the amorphous diamond powder to have been converted into brilliant crystals, which on heating in an oxygen current could be made in their turn to disappear.

Though the amount of material thus obtained was still too small to allow of any analysis, the way in which combustion occurred distinctly points to the presence of diamonds. Dr. von Bolton therefore maintains that lighting gas and other gaseous carbon compounds, under the action of mercury gas, will give off their carbon not only in the amorphous form, but also as diamond crystals, provided they be afforded an opportunity of growing on some mother substance.



Amorphous diamond powder.



Diamond crystals from lighting gas.

An Apparatus for Weighing Liquids in Tanks

By Dr. Alfred Gradenwitz

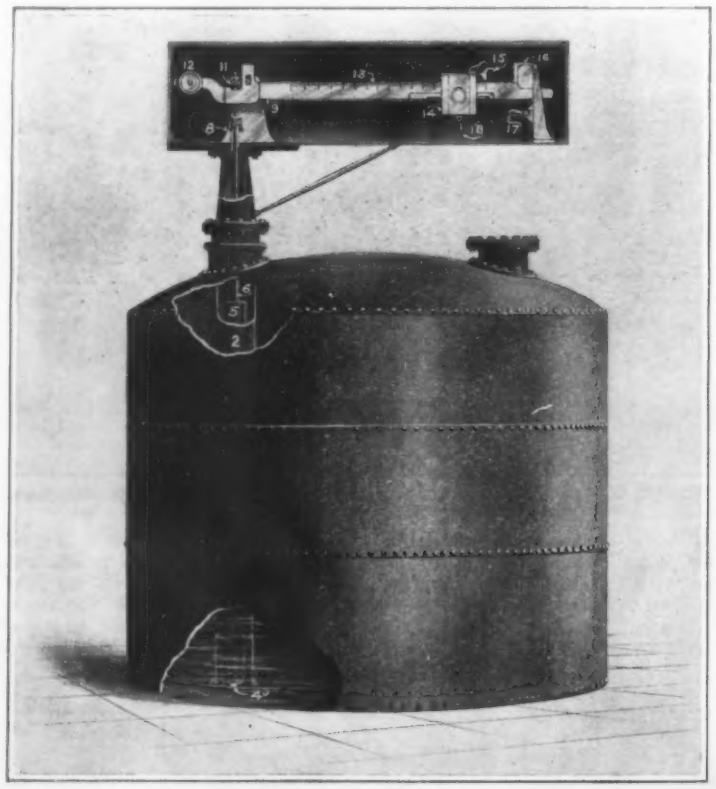
THE determination of the weight of liquids in tanks, especially those having a specific weight different from that of water, is a most difficult operation, the more so as certain liquids, for instance paraffin products, will settle in layers of different density.

According to the usual process for ascertaining the weight of liquids, the cross-section of the tank should be known at every level, and the level of the liquid in the tank is measured. The quantity of liquid thus obtained, multiplied by its specific weight, then gives its weight. It would be too long here to enumerate all the different sources of error met with in determinations of this kind; that the process is rather uncertain and most laborious, will be realized at a glance.

The apparatus invented by Mr. Theo. Hillmer at Bucharest, which has for some time been in operation at the Astra Romana Company, does away with these drawbacks. Being based on the principle of Archimedes, it gives by direct weighing the weight of any liquid inclosed in a tank, independently of its density (or specific weight). This apparatus after all is merely a Roman balance, which is fixed on a column installed at the bottom of the tank. From the short arm of this balance is suspended a float, reaching nearly to the bottom of the receptacle. When in this position, the sliding weight of the balance points to zero. Now as there is a constant ratio for each given height between the horizontal cross-section of the float and the tank respectively, the liquid replaced by the float always bears the same ratio to the liquid contained in the tank at the same height. By moving the sliding weight until the equilibrium is established, the index again points to zero, the weight of the liquid replaced by the float and (in accordance with the constant ratio) also the weight of the liquid contained in the tank is found. If the scale of the balance be calibrated in accordance with this ratio, it will give immediately the weight of the liquid and, if desired, can be made to print weighing tickets.

In the engraving which shows the arrangement of the apparatus, is illustrated a tank which may be of variable cross-section. Into this is inserted a hollow column or tube communicating with the tank which is fixed at its bottom. Into this tube penetrates a float 5, fused to a shaft 6 which at a given point below zero, rests on a stop 4. The lowest liquid level in the tank corresponds to the zero of the balance. The float is suspended freely from a bow 8, resting in a knife-edge and guide 11, on the shorter end of the beam 9, the central knife-edge of which is located on a jack. The specific weight of the float is greater than that of the liquid, and the float is so balanced as to be freely suspended when the sliding weight 14 is adjusted to the zero of the scale 13. The counterweight 12 allows this position to be accurately adjusted. The stop 17 serves to arrest the beam in its position of rest; 18 is a ticket printer, used in connection with large-sized tanks.

The whole apparatus is freely installed at the bottom of the tank, so as to be able to readily extend or



The arrangement of an apparatus for weighing liquids.

to contract with any difference of temperature. The tank having been filled to a given height, say h, with a liquid of any specific weight or with liquids of different specific weights, the buoyancy of the float—in accordance with Archimedes' law—just equals the weight of the liquid replaced by the float, independently of the density of the former. If the float, by increasing or decreasing the weight on the other beam, be again adjusted to its zero position, the weight brought into play obviously equals that of the liquid replaced, irrespective of its specific weight. If the balance be calibrated in accordance with the fixed ratio between the cross-sections of the float and the tank, there will obviously be no necessity for ascertaining the dimensions of the latter, the weight being read immediately off the scale.

As all determinations are referred to the zero of the float, this should be kept constant as far as possible. The column or tube carrying the balance is made of the same metal as the float (steel) so that the thermic expansions of the two perfectly balance one another. The balance may be as well installed at the bottom of the tank, communicating through a lever system with the float. Furthermore, as viscous liquids, such as crude paraffin, are liable to stick to the float, thus interfering with the working of the balance, the float may be installed in a special vessel filled with an auxiliary liquid, which communicates with the tank through a tube and tap.

These apparatus are extremely sensitive, being fitted if desired with very thin floats (down to 1/200 millimeter diameter). The one represented in the illustration has a capacity of 2,600,000 kilogrammes, is the largest weighing machine in the world and allows of an accuracy of 2 kilogrammes per 10,000.

Immunity Against Poisons

SOME curious results have been from time to time produced by scientific experiments with "serums." The chief advances in scientific treatment of many diseases have been made through the application of these results. A new line of application is suggested by experiments made in France during the past two or three years.

It is known that extracts from the thyroid gland, from the brain and from certain other organs act as violent poisons when injected into the veins. When one of these extracts is dissolved in salt water of a density corresponding to the salinity of the blood, and a quantity of the solution is injected into the veins of a rabbit, the animal quickly collapses. If, however, two or three drops of the solution are first injected, there are no serious consequences apparent; and after a few minutes the rest of the fatal dose may be administered with absolutely no bad results.

This method was described by three French experimenters in a paper which was presented to the Paris Academy of Sciences, in a sealed envelope, a year ago last December (1910). They continued their experiments, and the papers were opened at the first meeting this year. In the meanwhile, however, similar experiments had been conducted by other biologists, who came to similar results, and two of these, Champy and Gley, have even gone farther. They find, for example, that after the first injection of a very small quantity, repeated and large doses may be injected with impunity. If the blood of a rabbit that has acquired immunity through this treatment is injected or transfused into the veins of a normal rabbit, it acts as a poison; the rabbit treated with such poisonous blood goes into convulsions, then suffers a depression and is finally overtaken by death. If the blood is first withdrawn from the immunized rabbit and allowed to stand for a few hours, it not only loses its poisonous property, but it acquires the peculiar power of inducing immunity in another animal.

Lambert, Ancel and Bouin have sought by means of experiments to work out another method for inducing immunity to these poisonous substances. They have succeeded only to the extent of obtaining analogous results with injections into the peritoneal cavity and under the covering of the brain or spinal cord. Simple hypodermic injections did not produce the desired results.

The principle involved in these experiments had been discovered in connection with the occasional alarming symptoms observed after injection of diphtheria antitoxin or of serum for infantile paralysis. In these cases, if a very small quantity is introduced some time in advance of the main dose, the unfavorable effects are not produced. Very recently definite schedules have been worked out for the preliminary treatment of patients to prevent the undesirable reactions. Treatment for *anti-anaphylaxis*, as it is called, is now very generally successful.

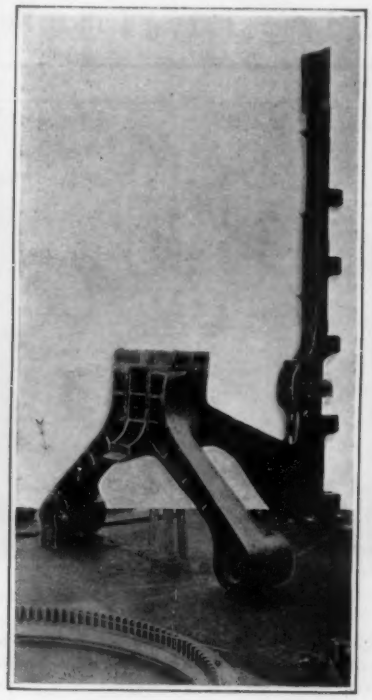
The study of toxins and antitoxins has borne some most valuable fruits in the past, and there is every reason to suppose the harvest is not all gathered.

Curiosities of Science and Invention

Largest Lightning Arrester in the World

SOME idea of the enormous size of lightning arresters now used on high tension lines is indicated in the accompanying engraving. This particular piece of apparatus is one of the largest in the world, and was built for a 140,000-volt transmission line. The dimensions of the lightning arrester may easily be estimated by comparing it with the men in the picture. The interior of the lightning arrester is filled with cone shaped cups of aluminium stacked up and separated one from the other by insulating spaces. Each cup contains some electrolyte and dips into the electrolyte contained in the cone below it. Thus a series of cells is formed. Very little current passes through such a cell below a certain critical voltage, but above this voltage the flow is very large. The critical voltage in each cell is 350, and enough cells are added to raise the critical voltage of the entire series to 1½ times the normal line voltage. The steel tank in which the stacks are contained is filled with oil, to improve the insulation and prevent evaporation of the electrolyte.

Lightning arrester for a 140,000-volt line.



Rudder post of the S. S. "Imperator."

A Tricycle Street Sweeper

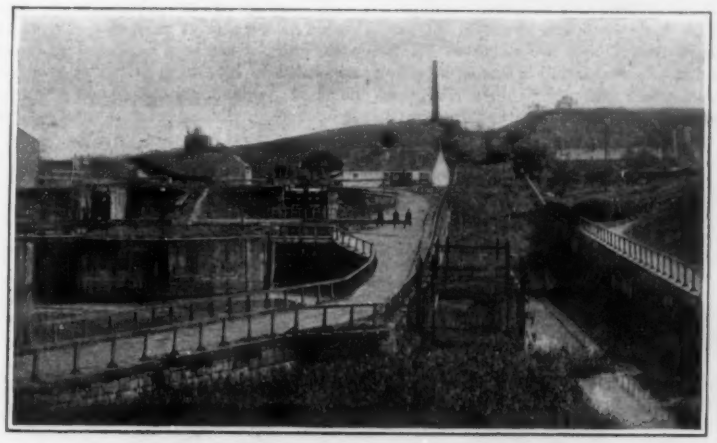
THE French champion bicycle rider Jacquelin is not satisfied with the triumps he has achieved in the rink and long-distance races. He has turned out to be an inventor of a very practical bent of mind. Jacquelin has just secured a patent for a tricycle to be used in street cleaning. A cylindrical brush is fastened by gas pipes to the tricycle. In front of it and between the two rear wheels is a basket or scoop for the sweepings. Above the brush a guard is fastened which prevents the sweepings from dropping out of the basket. When nearing a heap of dirt, Jacquelin backs his tricycle, the brush revolves, picks up the matter and throws it into the receptacle. This is, however, only necessary when considerable quantities of dirt have to be collected; if it is simply intended to sweep the street, this is done while the rider rides the tricycle in the ordinary way, the brush turning and gathering the dust into the basket. The machine does the street sweeping more quickly and thoroughly than a number of men can accomplish it.

A tricycle street sweeper.

An ever-flowing coffee-pot.

The Old Incline of the Monkland Canal

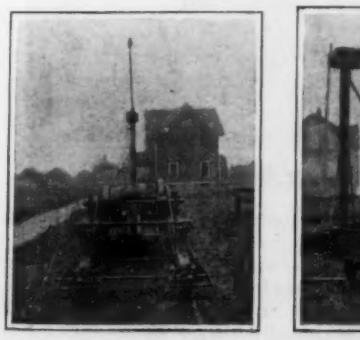
BEFORE railways were even thought of, the Glasgow Corporation had to consider ways and means to supply the rapidly growing city with an efficient coal supply from the Lanarkshire coal fields. The famous James Watt was consulted, with the outcome that the Monkland Canal was projected. The work was commenced in 1761, but before its completion it was abandoned for lack of funds. Finally it was finished by a private company. The chief point of interest is the inclined plane which was used for conveying boats to the higher or lower level when the canal was in the heyday of prosperity. The boats were run on cradles or carriages and the latter ran on rails. They were pulled by cable and steam power to the top of the incline, 96 feet above, and there launched on the upper level. Railway competition has reduced the traffic on the canal to a minimum, but although the old portage has been abandoned altogether the lock gates still open and shut to accommodate boats plying to a fire-clay works situated along the banks.

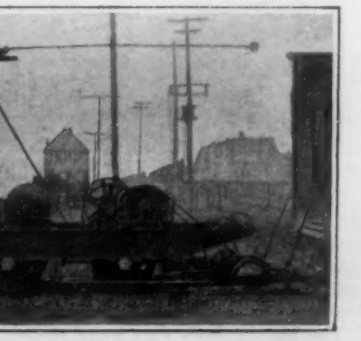


The old incline on the Monkland canal, designed by James Watt.

Rudder Post of the S. S. "Imperator"

ATLANTIC liners are now so large that it is difficult to gain an adequate conception of their magnitude because there is little with which we can actually compare them. When, however, we take individual parts of such a vessel and compare them, say, with the stature of a man, the effect is startling indeed. The accompanying illustration shows the rudder post of the steamship "Imperator," the new mammoth ship, building for the Hamburg-American Line. The rudder post is in two sections bolted together. It reaches to a height of 53 feet and weighs a hundred tons. The man standing beneath the arrow at the left-hand side shows what an immense casting this is. The casting will support the bearings for two of the four propellers of the ship. The "Imperator" will measure 900 feet in length, and will have a beam of 96 feet. Her engines of 70,000 horse-power are designed to give her a speed of 22½ knots. We are informed that the vessel will carry 60 life-boats and many collapsible boats and rafts, so that there will be ample room for all the passengers and crew.





Machine for grinding rails at welded joints.

An Ever-flowing Coffee-pot

A VERY mystifying advertising novelty has recently appeared in store windows, consisting of a vessel from which pours an unending stream of liquid. The device takes different forms. It may be a keg of ink, or a can of oil, or a pitcher of milk or, as in the illustration, a pot of coffee. Where this supply of coffee comes from is the puzzle. The only connection between the coffee-pot and earth appears to be through the chain by which it is suspended from a bracket; but it is hard to conceive of supplying so copious a flow of coffee through such small channels as would be provided by the chains were they hollow. Sometimes the pot is suspended by a thread. The only other connection is the stream itself; and here is where the secret lies. A glass tube, bent to a parabolic curve, passes up from the cup through the stream of coffee to the mouth of the coffee-pot, and through this tube the coffee-pot is kept supplied.

Gymnastics as a Training of the Nerves

EVERY person who has received gymnasium training is aware of the fact that an exercise which calls for painful effort on the part of the beginner is often performed almost without any conscious effort at all after a certain amount of training has been received. Again, it is perfectly well known that brute strength alone does not make a gymnast, and that even a simple exercise may offer great difficulty to a muscular and well-developed individual who has not been trained in the gymnasium. The explanation for this is made plain in an article by Prof. du Bois Reymond in *Die Umschau*, who points out that one of the essential functions of gymnasium work is not so much to build up muscle as to train nerves and nerve groups to work in proper unison and co-ordination.

Electric Rail-grinding Machine

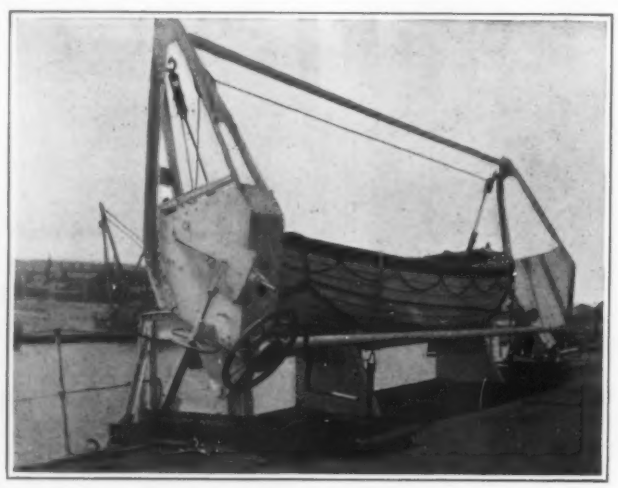
IT has been observed that welded rails of electric railway lines show a tendency to wear rapidly at the joints, forming "cups" or depressions. At first it was supposed that the process of welding had softened the ends of the rails, and that the "cupping" which took place was due to this condition. To overcome this, a water jacket was placed on the head of the rail during the process of welding, but even with the use of the water jacket the rails continued to "cup" at the joints. It was then decided that the welding caused a ridge to form on the working surface of the rail, and that it was the hammering of the wheels as they dropped from this ridge that caused the "cupping."

Being unable to obtain a machine to remove this ridge satisfactorily, Mr. John Kerwin, superintendent of tracks of the Detroit United Railways, designed one for himself, for this purpose, as indicated in the illustrations. It consists of a self-propelled car which operates emery grinders, mounted on a sliding carriage. This carriage may be adjusted automatically or by hand to control the position of the emery wheels so they will take from the head of the rail cuts of required length and depth.

What Inventors Are Doing

Simple Patent Law; Patent Office News; Inventions New and Interesting

Lowering the boat.



The Martin davit.

Controlling the boat as it drops.

New Types of Davits

SINCE the steamship "Titanic" disaster, not only the governments of all nations and steamship companies, but the general public as well, are deeply interested in the question of safety appliances on shipboard. Fortunately, the "Titanic" was equipped with the excellent Welin davit, which has a wide reach and which operated admirably during the moments that preceded the sinking of the "Titanic." Had the vessel been equipped with the ordinary type of davit the loss would have been even more appalling.

The ordinary davit can not handle a sufficient number of boats in time of peril. No increase of boat accommodation can be of the slightest avail if sufficient means are not employed to handle them.

The greatest danger in launching lifeboats is the fact that they are launched so close to the ship's side, so that in a rough sea they would be smashed against the side of the vessel. If the occupants are not thrown into the sea, the lifeboat is damaged so that it becomes entirely useless. This danger is overcome in the Welin davit, which we have already illustrated, and in the davits herewith pictured.

One of these, the McVeigh-Dougherty, is built to swing a boat, loaded to its full capacity of passengers, far from the ship's side. It will handle four or five boats in rapid succession.

The McVeigh-Dougherty davit has a reach as far inboard as it has outboard. After launching the first boat it will reach back on the deck for the second, third and fourth and handle them as fast as they can be filled.

To drag boats across the deck of a vessel and place them in a position for the old style davits to handle is a process slow and dangerous in the extreme. As most boats are clinker built, the danger of making them unseaworthy by dragging them against the plates or deck obstructions must not be overlooked. It must also be remembered that it would take a large number of men to handle heavy boats in this fashion. Derricks built on the same principle are working daily, handling enormous loads.

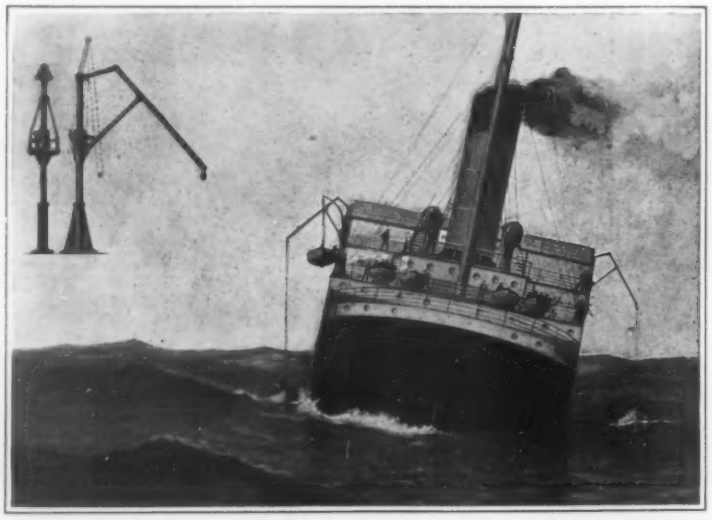
The davit consists of two standards, each carrying a system of extensible lever arms from which the boat is dropped into the water. Each system of lever arms consists of a boom, the inner end of which is pivoted to the standard and the outer end of which is pivoted to a cross beam. The lower end of the cross beam carries a pulley through which is reeved the rope by which the boat is supported; the other or upper end of the beam is pivoted to a link which in turn is pivoted to the top of the standards. In its extended form each system of lever arms assumes the position shown in full in the small upper left-hand diagram annexed; the dotted lines in the same diagram show each system collapsed.

The system is worked outward by means of a worm-screw and a quadrant. Since the screw is short only a few turns will send the davit out to its full reach. Should the screw break, the davit will not fall with its load, but will drop only far enough to bring the load, the cross beam, and the connecting link into a state of equilibrium.

Another davit is the invention of Mr. Fred E. Martin of Toronto, Canada, a practical seaman of wide experience. Mr. Martin after years of careful study and experimenting has produced an apparatus for launching lifeboats that is at once simple, speedy and safe.

The Martin davit is designed to meet the very present need for a davit that will not only swing outboard any size of lifeboat fully loaded, but will also lower it quickly and safely to the water. The arrangement is such that one man can swing out and safely launch a fully loaded boat in less than two minutes.

The davit arms are mounted on cam-shaped tracks, and are actuated by the turning of a crank which sets in motion a simple worm gear acting on a shaft connecting both arms of the apparatus. By this means the lifeboat is swung to the outboard position and is then lowered as quickly or as slowly as may be desired under the perfect control of a strong band brake.



The McVeigh-Dougherty davit.

The Martin davit does away entirely with the manifold dangers arising from the use of manila rope as falls, being equipped with galvanized wire, specially woven for the purpose. This in itself means an annual saving of from 70 to 150 fathoms of manila rope per lifeboat, which is an item of considerable importance from the standpoint of the ship owner.

The dangers attending the use of manila rope falls have long been apparent to seamen, and where possible manila rope has been superseded in the rigging, and even mooring and towing hawsers are now commonly made of steel wire. The chief danger in using manila rope for lifeboat falls lies in the fact that when wet the ropes swell and are very apt to jam in the sheaves, making it almost impossible, if not altogether impossible to lower the boat. In addition to this they often become frozen, in which condition they are about as pliable as a bar of iron; and being frozen through and through, it is impossible even to hammer them into workable condition. Besides swelling and freezing the manila rope is subject to knots and kinks, which are frequent causes of jammed falls and consequent useless boats.

All bearings are self-lubricating, so that the davit can always be operated, even in cases where it has been neglected by those appointed to look after it. The working parts of the davit are inclosed in a watertight casing, which prevents snow or ice from interfering with its efficiency. The construction is of angle or structural steel, such as that used in bridge work or where the strain to be withstood is excessive.

With the Martin davit one man alone can launch the largest lifeboat fully loaded, and at all times have both ends of the boat under perfect control. He is not hampered by coils of manila rope which must be kept clear and free from knots and kinks, and even with the vessel listed heavily he is still able to outboard his boat, which is impossible with the old type of davit. The falls being wound on a drum, the operation of which is controlled by a brake, they are at all times under perfect control, which eliminates the danger of one end of the lifeboat dropping and throwing out the passengers, an accident which frequently happens when the boat is being lowered by manila ropes in the hands of a seaman.

Important Patents That Expire This Year

AMONG the important patents granted in 1895 and expiring in 1912 are the beehive patent of Danzenbaker, No. 547,164, of October 1st, 1895; the cottonseed delinter of Faulkner, No. 538,870, May 7th, 1895, and No. 546,270, September 10th, 1895; the Bessonette cotton press patent, No. 541,418, of June 18th, 1895; the Graves cylindrical cotton bale patent, No. 546,009, of September 10th, 1895; the Murray superimposed layer cotton press, No. 532,386, of January 8th, 1895; the cigarette machine patent of Baron, No. 543,840, of August 6th, 1895, making elliptical cigarettes; the cigar machine patent of Williams, No. 548,688, of October 29th, 1895, in which certain automatic movements are effected by suction; the Fries patent, No. 534,147, and Cochrane patents, Nos. 538,660 and 546,843, and Underwood patent, No. 543,143, for stemming tobacco leaves; the animal slaughtering patent, No. 541,278, of Hurford; the Maertens patent, Nos. 545,900 and 539,388, for extracting and separating wool fat; the synthetic perfume patent, No. 536,324, of Baur, of March 26th, 1895; the dredger patent of Bates, No. 545, 762, of September 3rd, 1895, involving the application in battery fashion of the Bowers system; the canal lock patent, No. 552,063, of Jones; the metal wired concrete patent of Orr, No. 550,801; the Hoffman and Falk patent, No. 545,040, for fused union of rail ends; the Thomas' pneumatically controlled switch and signal patents, Nos. 545,750 and 545,830; the fluid pressure clutch of Hartness, No. 541,483, of June 25th, 1895; the electric brake patent of Case, No. 548,952, of October 29th, 1895; to Leonard, No. 543,030, for fluid pressure car buffer; the patent to Hulett, Nos. 536,209 and 545,293, for coaling steamers; the hay handling patent, No. 535,725, to Porter; the motor vehicle patent, No. 540,648, of Duryea; the Diesel engine patent, No. 542,846; the Browning firearms patent, No. 544,661, of August 20th, 1895; the magazine gun patent of Lee, No. 547,583, of October 8th, 1895; Maxim's smokeless powder patent, No. 538,618; the projectile patent of John-

son, No. 541,280; the Horton well digging patent, No. 537,114, providing an expansible cutting device to operate below the well casing; the Massette and Black patent, No. 535,709, for recovering lost drilling tools from wells; the laundry washing machine patent, No. 550,672, of Baker; the acetylene gas patent to Dickerson and Suckert, No. 535,944, of March 19th, 1895; the Morgan patent, No. 544,627, August 13th, 1895, disclosing means for shaping rubber fabric into pneumatic tires; the shoe heel trimming machine patent, No. 543,491, of Langill; the copper reduction patent, No. 532,809, of Nichols and Jones; the metal turning lathe of McClelland, No. 533,997; the Burton metal welding patent, No. 537,405; the part aluminium horse shoe of Jerome, No. 539,058; the Duke patent, No. 548,909, presenting catalytic devices for igniting gas by the occlusion of the gas by the catalytic material; the fruit wrapping machine patent of Williams, No. 533,516, of February 5th, 1895; patent No. 551,751, to Belknap, for address printing machine; the Collyer patent, No. 546,695, for shoe stitching machine in which the upper is secured to the last by sewing threads instead of tacks; the patent, No. 533,330, to Von Seydlitz on which it is said Turkish carpets can be woven; the wood sawing patent, No. 550,825, to Gray, providing means for quartering, sawing in both directions of travel of the log; the Young patent, No. 538,888, for making matches from tapes; the match boxing machine patent, No. 538,835, to Palmer Denmead and Baughman; the cyclometer patents, No. 537,824, of Hastings, and No. 548,482, of Veeder; the price scales patent, No. 542,969, of Swift; the weight registering patent of Richards, No. 535,729; the Davis voting machine patent, No. 534,239; and the dental chair patent to Mann, No. 547,221, in which fluid under pressure is utilized in raising and lowering the chair.

Notes for Inventors

Measuring the Length of a Rope.—A device for measuring the length of a rope has been patented to Norman Dewar Macgregor Yorke of Glasgow, Scotland (No. 1,022,916). The device includes a suitable frame or casing and an endless traveling band, one run of which is supported on its inner side by an unyielding portion against which the band may be pressed in operation, and a suitable guide spaced from the outer side of such run of the band forms with the band a longitudinal space through which the rope to be measured is drawn in such manner as to cause the movement of the rope to correspondingly move the endless band, a suitable indicating mechanism being arranged for automatic operation by the traveling band.

An Edison Phonograph Recording Stylus.—A Thomas A. Edison patent, No. 1,024,839, has issued for a recording stylus consisting of a disk-like head or jewel which has a rounded periphery in which is formed a notch presenting a substantially circular cutting edge of a diameter less than two one-hundredths of an inch.

Improved Paper Bag Cooking.—In a patent, No. 1,024,637, Carl Lambert of Frankfort-on-the-Main, Germany, covers a method of cooking food by inclosing it in a paper bag which is grease and water tight and closing the bag and then subjecting the bag to heated air in an air-tight receptacle with the bag free of contact with the sides or walls of the receptacle.

The Patent Office Improves Its Classification.—The Patent Office *Official Gazette* has recently inaugurated a system of indicating the class and subclass of the newly issued patent which will be found, thus, for instance (cl. 30-12) at the end of the short heading immediately preceding the claims printed in the *Gazette*.

Bifocal Lens Blanks.—In a patent, No. 1,024,486, Walter I. Seymour of Chicago, presents a novel method of making bifocal lens blanks in which two bodies of glass differing in kind or index are united in a suitable mold while such bodies are in a plastic condition, and while both bodies are still in the mold, he imparts to the contacting surfaces the curvature desired in the finished lenses.

Why Not Electrical Manicuring?—Many modern barber shops have manicure departments and practically all such shops are supplied with electrical equipment. We are asked why it is not practicable and desirable to operate the manicuring devices by electricity. Possibly there is a field here for invention in devising and arranging the nail filing, brushing, tinting and other treatment instruments for operation by the supplied current. Chiropodists have used such instruments.

Draping a Dummy from an Uncut Length of Cloth.—Rubar F. Downey of Milwaukee, Wis., in a patent, No. 1,024,927, makes an interesting contribution to window dressing improvements in a method of draping a dummy from an uncut strip of cloth to cover the leg to produce the trousers effect and also to illustrate a coat sleeve and coat length by folding and securing the fabric in the special manner he describes.

No Need of a Match.—And now it's a cigar lighter patented, No. 1,025,001, to Andrew R. Mann, Jr., of Weisel, Pa. He provides for cigar lighting attachments, one for each cigar. It consists of an inflammable tube adapted at one end to fit on the lighting end of a cigar and having at its other end a bead encircling the tube and being a readily ignited fuse by which the tube can be caused to burn and so light the cigar on which it is fitted.

Tight Can Connection Made with Enamel.—In producing a can George Russell of McKeesport, Pa., in a patent, No. 1,024,702, provides for coating the inner surface of the can with flexible enamel and puts a second coat of the enamel on the portions of the metal forming the joints, the thicker portion of the enamel forming a tight connection.

How to Hold and Cut Glass Cylinders.—In patent No. 1,024,983, Robert L. Frink of Cleveland, O., shows a device supported outside of the cylinder to be cut and gripped within the cylinder. A glass cutting tool cuts the glass below the gripping means, the tool being rotated for the purpose.

An Improved Aeroplane Controlling Mechanism.—James Means has patented a mechanism for controlling aeroplanes in flight, which mechanism is operated instinctively by the aviator. Instead of using the usual wheel, Mr. Means employs a bicyle handle-bar. The handle-bar has three kinds of movements. It may be shifted forward and backward to operate the elevating rudder in front; it may be rocked from side to side to operate the ailerons; or it may be moved like an ordinary bicycle handle in order to operate the vertical rudder. These movements may be effected either independently or simultaneously.

Shaves with Two Blades at the Same Time.—A multi-bladed razor has been patented, No. 1,024,509, to Herbert C. Harrison of Lockport, N. Y., in which the razor of the safety form has a number of superposed removable blades spaced apart with their cutting edges rigidly secured in such a relation to each other that such edges may be used at the same time for shaving the same spot. The invention in its broad features is quite similar to the use of two or more blades, instead of one, on the ordinary commercial safety razor.

A Detachable Electric Row-boat Motor.—A detachable 25-pound motor has been invented which can be fastened in a few minutes to any canoe or row-boat by means of adjustable clamps. The motor can be packed under the seat of an automobile or in a dress suit-case. It has a maximum speed of 2,500 revolutions per minute. Two 6-volt, 60-ampere-hour storage batteries, connected in series, supply current for the motor. The motor is direct connected to a vertical transmission shaft about two feet above the water line. The row-boat motor is used both as a propelling device and as a rudder. The slightest change in the angle of the propeller changes the direction of the boat. The direction of the boat is reversed simply by turning the entire motor on a swivel arm. A steering wheel is fitted at the top of the electric motor.

Legal Notes

The Court Discusses Aggregation.—In Twitchell v. Rudolph & West Company, Mr. Chief Justice Clabaugh of the Supreme Court of the District of Columbia holding the Twitchell patent (No. 927,298) for pressure gage for pneumatic tires valid, said:

"In this case it seems to me there is more than a mere aggregation of parts that have been in use and are common to the public. Now that the plaintiff has produced the invention shown by the article in evidence, by putting together a lot of things that are somewhat similar, to say it is merely a mechanical aggregation is to my mind extraordinary. When a patentee has produced an arrangement which fulfills a long-desired want, namely, to ascertain the pressure in a tire, not as the air is being supplied, as in defendant's, but one which gives you the pressure after it is supplied, and in such a small compass and in such an absolutely novel manner, there must be more than a mere aggregation of parts. It is not only the work of the mechanic, but in this case it seems to me to be the novel combination which goes beyond mere mechanical putting together."

The United States Must Pay for Patent Infringement.—The Supreme Court has just decided two important cases in which the United States government or government officials were parties. In one case it affirmed the judgment of the U. S. Court of Claims awarding the sum of $136,000 for the use by the United States army and navy of the French invention of Col. De Bange, known as the DeBange gas check. The claim originated many years ago, the use of the invention resulting in part from the action of the Gun Foundry Board organized under a special act of Congress which in 1883 made a visit to the claimant's works in Paris, France, and inspected the DeBange system of ordnance. In describing the invention the Supreme Court says, "As said by the Court of Claims, through Booth, J., the invention described in the language of the claim was the yielding pad of asbestos and tallow," the Supreme Court adding, "And this the learned judge also said predominates as the one 'central idea' in every description of the patent." In the original suit damages were prayed in the sum of nearly one and one-half million dollars.

The second suit was in the case of William Crozier v. Fried. Krupp on writ of certiorari to the Court of Appeals of the District of Columbia. In the Court of Appeals the Krupp corporation sought an injunction to prevent the manufacture of the ordnance inventions and for an accounting. In denying the claimant's right to an injunction the Supreme Court by the Chief Justice referred to the undoubted authority of the United States to exert the power of eminent domain for the appropriation of a license to use the inventions and reversed the decree of the Court of Appeals of the District of Columbia without prejudice to the right of the owners of the patented inventions to proceed in the Court of Claims for compensation in accordance with the statutes in such cases made and provided.

Bankrupt Owners of Patent Applications.—Assistant Commissioner Billings *In re* Steller holds that where a party, McIntosh, transferred his application for patent to a company with a request for the issue of the patent to the company, was subsequently adjudged a bankrupt and the trustee in bankruptcy sold the right and the sale is approved by a court of competent jurisdiction, the assignee of the bankruptcy trustee should be recognized in the prosecution of the application for patent and that when the patents are granted, they shall issue to such assignee.

Suit Involving Patent Title.—In The New Marshall Engine Company and Marshall v. The Marshall Engine Company by Van Blarcom, its receiver, the Supreme Court by Mr. Justice Lamar has held, in effect, that the Federal courts have exclusive jurisdiction of all cases arising under the patent laws, but not of all questions in which a patent may be the subject matter of the controversy and that the courts of a State may try questions of title, and may construe and enforce contracts relating to patents.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

SHOE BUCKLE.—E. A. GUTHMAN, 39 Bay 29th Street, Bensonhurst, Brooklyn, N. Y. This invention provides a shoe buckle having a holding bar for a leather tab adapted to support the same and to secure the buckle to the shoe structure; and provides in a shoe buckle a back bar and a leather tab adapted to engage the same, the leather tab being economical and durable.

Pertaining to Aviation.

MONOPLANE.—R. H. HAAG, 1118 Garvin Place, Louisville, Ky. This device is easily guided, and the weight is arranged below the supporting surface, so that the stability of the monoplane is aided to a great extent. The bars forming the device are preferably of spruce, and the covering for the planes is of rubber-treated silk. The motor is inclosed by a housing, the latter being preferably of aluminium.

Electrical Devices.

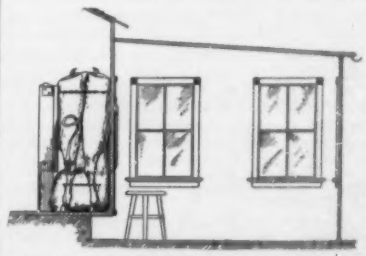
ELECTRIC ALARM FOR MAIL BOXES.—J. W. COE, JR., 57 Hudson Street, Yonkers, N. Y. The more particular purpose here is to provide, for use in connection with mail boxes, an electrical alarm operated with movements of the door of the letter drop and comprising an improved contact mechanism including a swinging pendulum for causing the alarm to be energized several times in quick succession.

WATER AND SEWAGE EJECTOR.—A. C. WELLS, care of Wells & Newton, Avenue B, between 17th and 18th Streets, New York, N. Y. The object of this inventor is to provide a tank with a conduit having two branches leading thereto, electrical means being provided for operating a switch commanding the branches, the switch being controlled by the pressure in a pipe extending through the tank, and by the pressure in one of the branches.

Of Interest to Farmers.

COTTON CHOPPER AND CULTIVATOR.—J. W. MCMILLAN, Box 93, El Dorado, Ark. This device is adapted to simultaneously chop cotton plants or the like and cultivate them, and to provide an implement which will simultaneously thin and cultivate the same. The implement has one or more hoes, adjustable as to their angle and depth of penetration, and having means for yielding in case of coming in contact with obstacles.

SANITARY STRUCTURE AND APPLIANCE FOR USE IN COW MILKING.—G. M. LUMMIS, Fort Myers, Fla. This invention provides a vertical partition interposed between the cow and the milker, and constructs the same with a large opening over and in which a flexible



SANITARY STRUCTURE AND APPLIANCE FOR USE IN COW-MILKING.

screen formed of rubber, skin, or fabric, and having holes for insertion of the cow's teats, is applied so as to completely exclude foreign substances from access to the milk pail. Thus in place of taking a pail or milking machine to a cow when tied in the open or in a stable, the cow is taken to a particular structure and is confined therein while being milked. The engraving shows a cross section of a cow stall or stable and an adjoining compartment where the milker is located.

Of General Interest.

LIFTING FRAME FOR STORAGE VESSELS.—J. P. VOELKER, 979 Third Ave., Manhattan, N. Y. This frame is of the type commonly packed and shipped in boxes and like receptacles, and the purpose thereof is to produce a device by means of which a number of vessels can be lifted out of the box when the top has been taken off, so as to enable the contents of the box to be removed in the quickest space of time.

FERROCONCRETE RIBBED CEILING.—J. H. A. WRISSENBERG, 35 Georgstrasse, Bremen, Germany. In this instance the inventor arranges the hollow bodies in pairs, so as to form a permanent casing for each ferroconcrete rib so that fillings of sound-deadening material may be placed between consecutive pairs of the hollow bodies, and other portions of the ceiling may be formed by ramming them down upon the above material.

CIGAR AND CIGARETTE HOLDER.—J. V. FERNANDEZ, Calle Jesus Maria No. 10, Camaguey, Cuba. This invention provides a holder with automatic means for use in ejecting the butt of the cigar or cigarette. An object is to

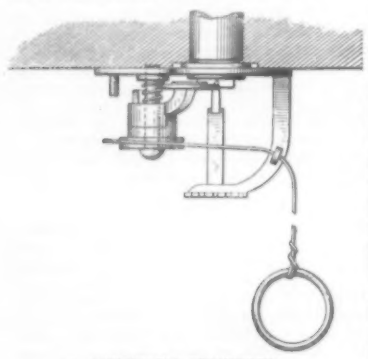
provide a holder having a self-contained perforating device whereby it is unnecessary to bite off the end of the cigar previous to smoking.

POCKET.—A. FANTL, 112 East 78th Street, Manhattan, N. Y. This invention refers to a garment for automobilists or the like, which is provided with an aperture and pocket, whereby a miniature timepiece may be held in a convenient and readily accessible position, as in the outside of a sleeve; and there protected against possible loss or damage.

TRIPOD ATTACHMENT.—O. F. THUNBERG, 620 Thomas Street, Seattle, Wash. This attachment enables the legs of the camera, or other tripod to be adjusted toward or from each other and securely clamped in position. The legs being extensible, the tripod may be set on very uneven ground. Ties and braces connect and brace the legs at such a point as to prevent any vibration due to their length, so that the instrument is very steady.

SHOE ATTACHMENT.—P. HAMMER, Marlboro, N. Y. The purpose in this case is to provide an attachment to be placed in the shoe, which will be yielding under the pressure of the foot, so as to absorb any shock or jar in walking, and provided with apertures and channels whereby air may be circulated around the foot and ventilate the same.

AUTOMATIC SPRINKLER.—S. B. ERICKSON, 27½ Atlantic Ave., Providence, R. I. It is well known that automatic sprinklers comprise parts which are held together by a solder fusible at a relatively low temperature. As usually made the opening of a sprinkler to a certain extent dismantles it and there are no means for shutting off the water flow from



AUTOMATIC SPRINKLER.

the sprinkler, other than by shutting off the flow to the system, at the source of supply. This sprinkling apparatus shuts off the flow with remarkable quickness, as the means for doing this is easily within reach, thereby saving a building from damage that would occur in the use of the apparatus formerly provided. The engraving shows in side elevation the sprinkler embodying the Erickson invention.

TRAP.—J. D. NIEDLITZ, 328 Central Ave., Jersey City, N. J. In this patent the invention relates to a form of trap particularly adapted for rat runways, and an object of the improvement is to provide a novel form of trap designed to receive the rat, and one in which the trapped rats are invisible. A further ob-

TRAP.

ject is to provide a trap so constructed that the scent of the bait will be carried to the prowling rodents. The engraving shows a side elevation of the metallic trap, parts of the sides broken away to show the internal mechanism.

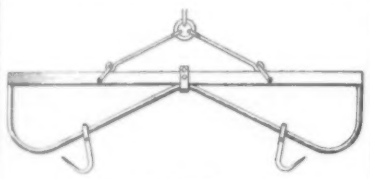
SMOKED MEAT.—A. ROTH, 7 Yonkers Avenue, Yonkers, N. Y. The purpose of this improvement is to provide a smoked meat provided with a coating to prevent formation of mold on the meat and shrinkage of the latter. For the purpose mentioned the coating is formed of the following ingredients in various proportions: oil of juniper berries, glycerine, molasses, comb honey and mutton fat.

ELECTROPLATING PROCESS.—F. J. MCELHONE, 109 Van Winkle Avenue, Jersey City, N. J. This improvement refers to electroplating or electrotyping and the purpose is to provide a process for treating the molds or cases which will improve the quality of the work and hasten the electroplating process. It is an improvement on the process covered by a prior patent granted to Mr. McElhone.

NON-REFILLABLE BOTTLE.—H. MARCUS, care of Joseph Block, 8 East 115th Street, Manhattan, N. Y. This invention comprises particularly an attachment for the mouth of the bottle, which is to be applied to the same after the bottle has been filled, and which is so constructed as to divert any fluid with which one may attempt to refill the bottle, into an annular chamber in the walls of the same.

TOOTH BRUSH.—A. O. KRETZSCHMAR, Endicott, N. Y. This invention refers more particularly to a device which comprises a pair of relatively movable, opposed brushes, by means of which the teeth can be cleansed at their inner and outer sides, simultaneously, the relative adjustability permitting the space therebetween to be varied at will, to accommodate teeth of different thickness.

GAMBREL.—J. L. JARVIS, Unity, Wis. This invention has for its purpose the provision of an inexpensive device by means of which the carcass of an animal may be suspended in such a position that the division of the same is facilitated by its own weight. The device is



GAMBREL.

in effect a bar having means for suspending the same, and provided with guide rails, that is the portions inclining downwardly and outwardly from the center of the bar, so that the weight of the carcass assists in its division. A front elevation of the device is pictured in the illustration herewith.

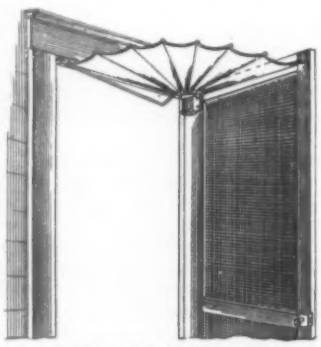
Heating and Lighting.

APPARATUS FOR CONTROLLING THE LIGHTING OF GAS FROM A DISTANCE.—E. KÖRNER, Blumenstrasse 1, Lützel, near Koblenz, Germany. In the apparatus, according to the present invention, the control ratchet is constructed as a rotating body pivoted on the diaphragm spindle and has, with regard to this latter, both a rotary movement and a pendulous movement corresponding to the depth of the ratchet tooth. In this way advantages in several respects are secured.

Household Utilities.

CONVERTIBLE COUCH AND BED.—L. B. JEFFCOTT, 250 West 15th Street, Manhattan, N. Y. The arrangement permits conveniently changing the couch into a bed or *vice versa* and to allow ready detachment of the parts for cleaning, repairing, etc. Use is made of a couch frame, a bed frame section mounted to swing, and a rod mounted to swing up and down and engaged by the rear end of a bed spring attached at its front end to the forward end of the bed frame section.

SCREEN DOOR ATTACHMENT.—J. E. JOHNSON, 923 South 11th Street, Brainerd, Minn. This invention is especially adapted to be connected to the top of the door and to the top of the door casing, whereby when the door



SCREEN DOOR ATTACHMENT.

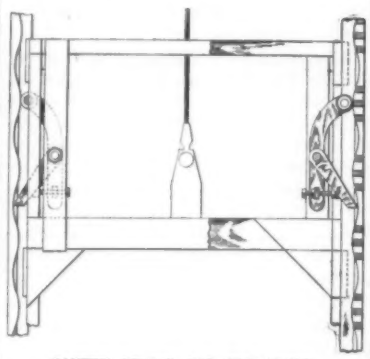
is opened, the entrance of flies may be prevented. The attachment is made up of a number of supporting rods together with a flexible material carried by the rods, said attachment being engaged by the screen door and door casing, so that when the door is opened the attachment will be expanded, coming back into folded position when the door is closed. The engraving shows a perspective view of the attachment in position.

Machines and Mechanical Devices.

PROJECTING APPARATUS FOR MOVING PICTURE MACHINES.—G. E. RIPLEY, care of University of Arkansas, Fayetteville, Ark., and W. N. GLADSON, Fayetteville, and R. E. THOMPSON, Heber, Ark. This invention is in projecting apparatus for moving picture machines, and has in view a reflecting mechanism to cause the image of one picture to fade into the next without employing a tinted or softening light, or otherwise lessening the brilliancy of the screen during the picture change.

ATTACHMENT FOR SPINNING SPINDLES.—T. LEWIS, 401 Depot St., Scranton, Pa. This improvement refers more particularly to an attachment which comprises a spring for holding a spindle-carrying sleeve in a normal position relative to its support, and constituting a keeper adapted to prevent the accidental displacement of the spindle from the sleeve.

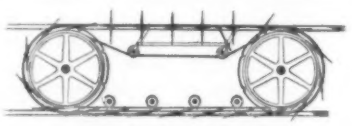
SAFETY DEVICE FOR ELEVATORS.—VOLNEY W. MASON, Providence, R. I. Mr. Mason's invention relates generally to safety devices for elevators and comprehends more particularly the mechanism which is adapted to operate when the car exceeds a certain speed, thereby stopping the car. The adjustable safety devite consists of pivoted members carried by the car, these co-acting with a suitable vertically extending rack in the elevator shaft. The inventor provides a device which consists of members carried by the car, which members are movable relatively to each other and which



SAFETY DEVICE FOR ELEVATORS.

co-operate with a vertically extending rack in the elevator shaft whereby, when the car exceeds a certain speed, the device may be brought into action, thereby stopping the car. The engraving gives a side view of a portion of an elevator car, together with the vertically extending racks carried in the elevator shaft.

HYDRAULIC PROPELLER.—J. F. STRUBLE, Girard, Kan. This propeller is especially adapted for use in running streams, is of simple and cheap construction, wherein the blades against which the water acts will be automatically moved into a position perpendicular to the direction of movement of the current as



HYDRAULIC PROPELLER.

they enter the water, and retained in this position until they are leaving the water, and will then be moved into a position substantially parallel with the direction of movement of the water. The illustration shows a side view of the improvement.

AUTOMATIC TIMER.—F. WALLER, JR., care of Fred Waller Co., 413 West Broadway, New York, N. Y. This timer is for use for timing exposures for developing paper, photographs and the like, the more particular purpose being to produce one of this type in which the various parts, when set for a particular exposure, may be restored to normal condition after the exposure, and that, too, independently of the immediate attention of the operator.

CENTERING DEVICE.—F. L. WHELLING and F. A. ROGERS, 746 Lake Street, Los Angeles, Cal. The object here is to provide a device for use on lathes and similar machines, and more especially designed for centering "offset" work, such as crank shafts, cam shafts, valve eccentrics, etc., arranged for keeping the work in one center while one or more cranks or cams are being turned.

WIND MOTOR.—W. T. PULLIAM, Tuscola, Ill. In the present patent the purpose of the invention is the provision of a new and an improved wind motor for use in actuating pumps or driving other machinery and devices, and arranged to utilize the kinetic energy of the wind to the fullest advantage.

MACHINE FOR PILING TEXTILE FABRICS.—C. J. PRIESTER, care of Kretsch & Priester, 25 Bleecker Street, New York, N. Y. This machine is arranged to expand the rolls of cloth to be piled and to balance the same to avoid mechanical pounding; to lift the rolls thus expanded and balanced in supported relation upon the machine; to draw the cloth from the roll without exerting a stretching strain thereon; to cut the cloth accurately to align the cut ends thereof to form an even pile; and to measure cloth during the operation of piling it.

VENDING MACHINE.—H. E. MARSHALL, P. O. Box 205, San Antonio, Tex. This machine is of a simple, easily operated character for dispensing merchandise such as magazines, wherein the carrier of the merchandise is moved to deliver the magazine, and is normally locked to prevent such movement, which is unlocked by the insertion of one or more coins.

MOTOR.—J. LUCAS, 626 Pacific Avenue, Spokane, Wash. This simple, economical mechanism is especially adapted for running light machinery, which will, while delivering a constant and steady motive force, only require the attention of the operator at intervals, thus permitting his attention to be given practically wholly to the machinery.

VALVE.—R. H. ALDRICH, care of Aldrich Pump Department, Allentown, Pa. In this case the object is to provide a structure which will be automatically actuated by the water passing through the valve for causing the movable part of the valve to seat at a different place upon each opening and closing of the valve.

CUTTING MACHINE.—H. FUCHS, 240 West 27th Street, New York, N. Y. In this machine, the material is cut so that it may be cut to any length desired, and the method of cutting is so conducted that the stock end or end of material from which a piece has been severed, is automatically fed into the machine as the cutting means are returned to their initial position.

HOLDER FOR ASSEMBLED SHEETS.—G. F. C. HOUGHTON, care of John Wilding, care of Fort Wayne Print Co., 214 East Main Street, Fort Wayne, Ind. This invention relates to holders for assembled sheets in the keeping of accounts and contemplates a holder not only for hand writing but for typewriting in connection with either a flat-bed typewriting machine or any so-called cylindrical typewriter, both for blind and visible writing.

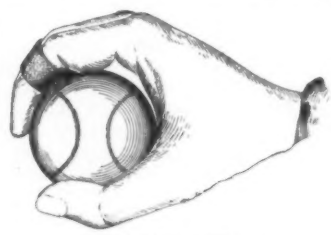
Prime Movers and Their Accessories.

INTERNAL COMBUSTION ENGINE STARTER.—C. A. KINNEY, Seneca, Pa. One purpose here is to provide means by which the shaft of an engine may be rotated without the necessity of the usual cranking operation. Another, is to provide means for reversing the direction of rotation of the engine by the movement of a single lever.

AUTO OR GAS STARTER AND INDICATOR.—G. E. OCAIN, 1221 Chicago Avenue, Oak Park, Ill. This engine may be started without necessitating the driver leaving his seat, and the invention includes an indicator by which it may be instantly ascertained which of several cylinders is ready for ignition of the explosive charge.

Pertaining to Recreation.

BASE BALL CURVER.—R. W. JONES, care of Mary Jane Garment Company, 14th and P streets, Lincoln, Neb. Mr. Jones provides means in this case readily attachable to the hand for causing a ball to curve when thrown from the hand. A vacuum cup is held in position by a band made of a size to fit a finger,



BASE BALL CURVER.

but is preferably made of a size to fit two or more fingers so that the cup may be shifted or adjusted to any position with respect to the fingers. In this way the cup may be adjusted nicely to any point for giving a great or small curve, or various kinds of curves. The illustration shows a hand grasping a ball having an embodiment of the invention applied to the hand and pressing against the ball.

Pertaining to Vehicles.

GYROSCOPE FOR AUTOMOBILE TORPEDOES.—A. E. JONES, Fiume, Austria-Hungary. This invention has for its object controlling means for the flywheels of gyroscopes of automobile torpedoes by means of a jet or motor fluid supplied through two diametrically opposite twyers and the invention is particularly intended for obtaining a diminution of weight and bulk.

VEHICLE TIRE.—J. F. BOSQUETT, 75 Laidlaw Avenue, Jersey City, N. J. This tire is more especially designed for use on the wheels of automobiles and other vehicles, and is arranged to provide the desired resiliency without the use of inflatable members to render the tire puncture-proof and to prevent the vehicle from skidding on slippery roadways.

Designs.

DESIGN FOR A BASE FOR GEM SETTINGS.—H. ACKERMAN, care of John Nordt, 51 Maiden Lane, New York, N. Y. This ornamental design shows the manner in which the prongs or fingers which secure the gem to the base are attached to the base by means of lateral extensions from the inner side of the prongs.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 12 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance.

AUTOMOBILES AND MOTORCYCLES

AUTOMOBILES, $50.00 up; Motorcycles, $20.00 up; guaranteed for one year, shipped freight, prepaid. Largest list and lowest prices in the world. King, Automobile Broker, Dept. S. A., 215 West 125th Street, New York City.

BUSINESS OPPORTUNITIES

Two great ingenious works, short of funds, looking for partner to patent in foreign countries. One piece has 16 claims. For information or models address Luigi Viezzi, 606 Palisade Avenue, Jersey City, N. J.

FOR SALE

FOR SALE.—In business center of Philadelphia, Pa., a model making shop for $600.00. Low rent. Owner has engaged in larger business. Address, Coupling, Box 773, New York.

PATENTS FOR SALE

FOR SALE.—Outright or on Royalty. Touring Skate, U. S. Patent No. 1017162. Illustrated descriptive matter sent on application. Alfred Naumann, 101 Beekman Street, New York City.

SALESMEN WANTED

ANY first-class competent salesman capable of selling the wholesale machinery trade who desires to handle a newly invented machine of great merit in which there is no competition, should write National Mfg. & Sales Co., 350 Huron St., Toledo, O.

MISCELLANEOUS

LORAIN, with best harbor on Lake Erie, and six railroads, offers unexcelled shipping facilities and finest sites for manufactories in Ohio. Low prices. Low taxes. Booklet. B. G. Nichols, Lorain, O.

FREE SAMPLE goes with the first letter. Something new. Every firm wants it. Orders from $1.00 to $100.00. Nice pleasant business. Big demand everywhere. Write for free sample. Metallic Mfg. Co., 438 N. Clark, Chicago.

AUTO CYLINDERS rebored, pistons and rings fitted, gear cutting in chrome nickel steel, cranks connecting rods, transmissions, etc. reproduced; send old parts; designing and building of special machinery, model and experimental work. McCadden Machine Works, Minneapolis and St. Cloud, Minn.

INQUIRY COLUMN

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated. **MUNN & CO., Inc.**

Inquiry No. 9254.—Wanted, the name and address of manufacturers of lead pencils and pen holders, such as are used for printing advertisements on.

Inquiry No. 9255.—Wanted, to buy a patent roller, a ball-bearing axle, which could be purchased on a royalty basis; it must be cheap and fully proved.

Inquiry No. 9256.—Wanted addresses of parties having Pitchblende deposits, if able to ship ore.

Inquiry No. 9257.—Wanted addresses of firms selling second-hand water turbines.

Inquiry No. 9258.—Wanted addresses of parties having gem materials to offer in any part of the world.

Inquiry No. 9259.—Wanted to buy a machine for removing the coating of a filbert.

Inquiry No. 9260.—Want addresses of parties able to ship corundum, garnet, flint, emery or any material suitable as an abrasive.

Inquiry No. 9261.—Wanted, a manufacturer to make card games.

Inquiry No. 9262.—Wanted, to buy a glass which is a conductor of electricity, and the address of the makers of the same.

Inquiry No. 9263.—Wanted, name and address of manufacturer of pantaloon stretchers with clamps, which is capable of being folded up.

Inquiry No. 9264.—Wanted, the name and address of manufacturers of Date Fitting Machines.

Inquiry No. 9265.—Wanted, names and addresses of manufacturers of machinery for making picket fences.

Inquiry No. 9266.—Wanted, to buy machinery for fastening wire cloth to wooden frames with coppered tacks.

Inquiry No. 9267.—Wanted addresses of manufacturers of metal specialties in connection with plate or window glass.

Inquiry No. 9273.—Wanted, to buy a globe for a parlor fountain, working on the Heron system.

Inquiry No. 9274.—Wanted, the name of a manufacturer of a machine to make cushion covers for fruit crates.

Inquiry No. 9275.—Wanted, name and address of manufacturer of stock patterns of platen job printing presses.

The New York Aero Show

(*Concluded from page 478.*)

senger's seat is located in front of the aviator's seat and is just back of the planes. The wires for telegraphing can be seen strung along the top of the upper plane. The weight of this machine is about 1,800 pounds and it can carry some 40 pounds dead weight besides. It has a spread of 44 feet and some 450 square feet of surface. The hydro-aeroplanes shown were fitted with double pontoons, whereas the Curtiss machine had the usual single float, 16 feet long by 2 feet wide by 1 foot high.

Another large biplane was exhibited by Mr. P. Schill, of the Max Ams Machine Company. This was a large Farman type machine with a 42-foot spread on the upper plane and a 36 on the lower, the width of the planes being 6 feet. A total supporting surface of 504 square feet was found in these planes. There was a covered-in body at the front part containing two passenger seats side by side, with a seat in front for the pilot. A starting crank was also arranged so that the pilot could start the motor. This is a large 8-cylinder engine of the V-type, capable of developing 70 to 80 horse-power. The machine was mounted on two single-step floats, and is said to have made a speed of 45 miles an hour on water, and 60 when in flight.

A novel biplane was that of the Christmas Aeroplane Company of Washington. This has 6½ by 40-foot planes forming a cantilever truss—a type of aeroplane very similar to that which was first used by Curtiss, but which Dr. Christmas claims he has succeeded in patenting. This form of truss is particularly adapted to the carrying of heavy loads, and it is the intention to build commercial machines for carrying great weights. The biplane shown was fitted with a Gyro motor of 50 horse-power, which motor was described in the last issue of the SUPPLEMENT.

Another machine which we illustrate is a large quadri-plane built by Mr. H. W. Jacobs, the assistant superintendent of motive power of the Santa Fé Railroad. This machine is built almost entirely of Theta steel tubing, a new form of tubing like the Greek letter Theta. The two middle planes have a spread of 37 feet and are fitted with ailerons, whereas the upper and lower planes have a spread of but 25 feet, the chord being 4¼ in each case. There are 544 square feet in the main plane, while the tail surfaces, which are 4½ by 10 feet in size, supply 180 square feet additional. The machine is 17 feet high and 29¼ feet long. It is built upon a keel of wood having the shape of an inverted T, and is very substantial in construction, a 250-pound man being able to hang from the end of the lower plane without springing it in the least. There are two large 4-foot wire wheels having a 5-inch tread and a weight of 40 pounds apiece used to support the machine in front, while a smaller wheel is used at the rear. Pneumatic shock absorbers are provided by telescopic tubes, in which there is an air pressure of 110 pounds to the square inch. Two horizontal opposed motors of 25 horse-power each drive, by means of belts, two pulleys carrying metal propeller blades. The belts are tightened by means of jockey pulleys, operated by two levers in the car located in the main plane. Two separate power plants are thus provided, the intention being that if one gives out the other will drive the machine. The control is by means of a single vertical wheel, which is pushed forward to ascend and pulled back to descend, while by turning the wheel, the ailerons are moved, and by twisting it upon its vertical axis, the vertical rudders are moved. The total weight of this machine is 1,700 pounds. Seats are provided for four people and it is claimed that in tests on April 17th this machine flew a distance of 340 yards at a height of 40 feet when carrying 2 men, 3 gallons of oil, and 10 gallons of gasoline, making a total weight of 2,037 pounds. Besides developing this new ma-

chine, Mr. Jacobs has brought out a new air-cooled motor of the 8-cylinder V-type. One of the special points to be noted on the multiplane is the joints in the steel tubing, which are made with a special fitting in two halves that clamp the tubes. A bolt is provided for drawing the two halves together, and there are also grooves in the fitting into which the flanged ends of the tubes are pressed.

Another machine of novel appearance which we illustrate was built by the American Aeroplane Co. of Wilmington, N. C., after the design of David Palgren, the president and inventor. The single surface is placed 18 feet above the ground at the front and 10 feet at the rear, the idea being to have an extremely low center of gravity in order to obtain a parachute effect in case of a forced descent. The spread of the plane is 36 feet and the over-all length 30 feet, the area being 350 square feet. There is a fish-tail horizontal rudder and a triangular vertical rudder fitted at the rear. The machine is mounted on a square base frame of steel tubing in which seats are provided for passengers and the fuel tanks are carried. The bottom of the frame is but 2 feet above the ground. The wheels are shod with 3×18-inch pneumatic tires, the rear wheels being turnable for the purpose of steering and being also fitted with brakes. The motors used are two 50 horse-power A-M revolving-cylinder, 2-cycle engines, connected together by a stationary shaft, which holds them at a fixed space apart. The front motor carries a $7\frac{1}{2} \times 7\frac{1}{2}$ foot two-bladed propeller and the rear one a three-bladed propeller of the same diameter and pitch. These motors are started by a ratchet arrangement operated from the aviator's seat. They can be run together or separately as desired. The lifting surface of this machine is really made in three parts, consisting of a heart-shaped center with its point at the front, and having on each side a folding wing. Both these and the fish-tail horizontal rudder can be folded upward, and when so folded, they are expected to act as a parachute. The weight of the machine is 1,000 pounds, and it is expected to carry as many as twelve people or 1,000 pounds dead weight.

At the front end of the exhibition hall there was still another interesting monoplane, built by Mr. W. Irving Twombly. This machine was provided with small mica windows in the wings on each side of the body, so that the pilot can look down and see the ground below him. The most interesting feature of the machine, however, was a revolving-cylinder motor of the Gnome type, which was provided with mechanical inlet valves in the heads of the pistons. An interesting feature of this motor was the method of operating the valves by means of small pointed shoes attached to the valve-operating rods. These shoes travel in two annular grooves and are switched from one to the other at a certain point by means of a single cam. When traveling in the inner groove, the valve is closed, while when the shoe travels in the outer groove, it operates the valve. Similar shoes working push rods in the connecting rods operate the mechanical inlet valves located in the heads of the pistons.

This motor is made of very high class steel, and the inventor, Mr. W. Irving Twombly, has reduced the weight to but 100 pounds for a 50-horse-power engine. Mr. Twombly also exhibited a novel life belt for holding aviators securely in the bodies of their monoplanes.

The exhibit of engines was a particularly interesting one, there being fully a score of prominent American aeronautic motors on exhibition. Among the other rotary motors mention should be made of the McComber and the Trebert. These motors have their cylinders placed longitudinally along the stationary crankshaft and communicate the reciprocating motion of the connecting rods to the shaft by means of a plate in which the ends of the connecting rods rest in ball and socket joints in the McComber motor, and to a gear by means of bevel gears and small

EPICYCLIC TRAINS, which play an important part in toothed gearing, are ably described in Scientific American Supplement 1524. Price 10 cents. For sale by Munn & Co., Inc., and all newsdealers.

cranks on individual crankshafts for each connecting rod in the Trebert motor.

The A-M two-cycle motor was another interesting rotary motor seen on one of the freak machines. The regular two-cycle engines were represented by the Roberts Motor Co., which showed a 75-horse-power 6-cylinder motor, together with various parts, and the Elbridge Motor Co., which also exhibited a 4- and a 6-cylinder motor. The Frontier Iron Works of Buffalo showed an 8-cylinder V-type motor with copper water jackets and a 4-cylinder vertical motor with a new type of rotary valve. The Mead Motor Company, of Dayton, Ohio, also exhibited a 4-cylinder vertical motor with rotary valves. This motor was illustrated in the last issue of the SUPPLEMENT. The rotary valve is used on the Roberts two-cycle motor also, and this type of valve is coming into very general use. Other companies which exhibited 8-cylinder V-type motors and 4-cylinder vertical water-cooled engines were the Hall-Scott Motor Company of San Francisco, the Curtiss Motor Company of Hammondsport, N. Y., and the Max Ams Machine Company of New Rochelle, N. Y. (8-cylinder V-type only).

Besides the Wright and Kirkham 6-cylinder motors, which have already been mentioned, there was also a fine 6-cylinder water-cooled motor built by the Sturtevant Motor Company of Hyde Park, near Boston. This motor was described also in the last issue of the SCIENTIFIC AMERICAN SUPPLEMENT. Both the Trebert 8-cylinder and the 4-cylinder Maximotor were provided with a ball bearing crankshaft, a feature which greatly adds to the power and reliability of any aeronautic motor. The Aeroplane Motor and Equipment Company, of New York, exhibited several Gnome, Anzani, and Clement-Bayard French aeronautic motors. Thus it can be seen that a complete line of aeronautic motors, both domestic and foreign, were on view.

An exceedingly well-built biplane exhibited in the gallery was shown by the Gressier Aeroplane Company. This was a tailless biplane of the Voisin "Canard" type, with a long fuselage projecting out in front of the main planes and carrying the elevator (like that of the Blériot XI.) and the vertical rudder at its front end, as well as twin pneumatic-tired wheels below. A 6-cylinder, 60-horse-power Anzani circular motor, with propeller on its crankshaft at the rear, furnished the motive power of this machine. The aviator and passenger sit in the body a short distance in front of the main planes. A control somewhat similar to that of the Deperdussin monoplane was fitted.

Two other interesting machines in the gallery were the Curtiss biplane with which Glenn Curtiss won the International cup race in 1909, and Capt. Baldwin's "Red Devil" biplane, which has been all around the world. The latter rested upon the packing cases in which it made the trip.

An exhibit of glider models of the late Octave Chanute, the "Father of Aviation" in America, was another interesting feature to be seen in the gallery.

An Opinion of the Scientific American

IN the Mason City *Banner*, published at Mason City, Ill., we find the following appreciation of the SCIENTIFIC AMERICAN'S efforts to present the technical aspects of the recent "Titanic" disaster:

"Publishers are generally so busy and have so many things to look after themselves that they all too seldom fail to make any favorable comment on contemporary publications of high value and merit. I will depart this week from this customary custom of apathy and indifference and throw a few spring bouquets at the SCIENTIFIC AMERICAN. This paper is one of the most reliably accurate publications in the world, exercising the greatest care in the gathering of facts and the dissemination of scientific news.

"The feature of most special interest at this time is the most excellent account

given of the "Titanic" disaster. Three pages of the paper are devoted to this write-up, and for a valuable piece of literature to keep on this subject, it is worth a dollar to any man who cares for scientific data on these great catastrophes. There are also two pages devoted to icebergs, and in this there is much valuable information about these curious freaks of nature that has never before been published. Every high school and college in the land should have a liberal supply of this excellent number of the SCIENTIFIC for future reference.

"Following are just a few of the subjects discussed: 'Light Out of a Dark Tragedy,' 'Did the "Titanic" Sink to the Bottom?' "Titanic," the Last Word in Naval Architecture,' 'One Fatal Peril,' 'Half Speed Would have Saved the Ship,' 'How a Great Ship Went Down,' 'What We Know About Icebergs,' " etc.

Rules Governing the Competition for the $15,000 Flying Machine Prize Offered by Mr. Edwin Gould

1. A prize of $15,000 has been offered by Mr. Edwin Gould for the most perfect and practicable heavier-than-air flying machine, designed and demonstrated in this country, and equipped with two or more complete power plants (separate motors and propellers), so connected that any power plant may be operated independently, or that they may be used together.

Conditions of Entry.

2. Competitors for the prize must file with the Contest Committee complete drawings and specifications of their machines, in which the arrangement of the engines and propellers is clearly shown, with the mechanism for throwing into or out of gear one or all of the engines and propellers. Such entry should be addressed to the Contest Committee of the GOULD-SCIENTIFIC AMERICAN PRIZE, 361 Broadway, New York city. Each contestant, in formally entering his machine, must specify its type (monoplane, biplane, helicopter, etc.), give its principal dimensions, the number and size of its motors and propellers, its horse-power, fuel-carrying capacity, and the nature of its steering and controlling devices.

3. Entries must be received at the office of the SCIENTIFIC AMERICAN on or before June 1st, 1912. Contests will take place July 4th, 1912, and following days. At least two machines must be entered in the contest or the prize will not be awarded.

Contest Committee.

4. The committee will consist of a representative of the SCIENTIFIC AMERICAN, a representative of the Aero Club of America, and the representative of some technical institute. This committee shall pass upon the practicability and efficiency of all the machines entered in competition, and they shall also act as judges in determining which machine has made the best flights and complied with the tests upon which the winning of the prize is conditional. The decision of this committee shall be final.

Conditions of the Test.

5. Before making a flight each contestant or his agent must prove to the satisfaction of the Contest Committee that he is able to drive each engine and propeller independently of the other or others, and that he is able to couple up all engines and propellers and drive them in unison. No machine will be allowed to compete unless it can fulfill these requirements to the satisfaction of the Contest Committee. The prize shall not be awarded unless the competitor can demonstrate that he is able to drive his machine in a continuous flight over a designated course; and for a period of at least one hour he must run with one of his power plants disconnected; also he must drive his engines during said flight alternately and together. Recording tachometers attached to the motors can probably be used to prove such performance.

In the judging of the performances of the various machines, the questions of stability, ease of control and safety will also be taken into consideration by the judges. The machine best fulfilling these conditions shall be awarded the prize.

6. All heavier-than-air machines of any type whatever, aeroplanes, helicopters, ornithopters, etc., shall be entitled to compete for the prize, but all machines carrying a balloon or gas-containing envelope for purposes of support are excluded from the competition.

7. The flights will be made under reasonable conditions of weather. The judges will, at their discretion, order the flights to begin at any time they may see fit, provided they consider the weather conditions sufficiently favorable.

8. No entry fee will be charged, but the contestant must pay for the transportation of his machine to and from the field of trial.

9. The place of holding the trial shall be determined by the Contest Committee, and the location of such place of trial shall be announced on or about June 1st, 1912.

10. Mr. Edwin Gould, Munn & Co., Inc., publishers of the SCIENTIFIC AMERICAN, and the judges who will be selected to pass upon machines, are not to be held responsible for any accident which may occur in storing or demonstrating the machines on the testing ground.

Uses of Sugar

IMPROVEMENTS in the processes of refining sugar have led to an extension of the use of this material in many directions. A number of these were indicated at a meeting of the French Association of Sugar and Distillery Chemists by Dr. Vivien.

1. As a preservative, in the preservation of fruits and vegetables, of condensed milk; it is mixed with flour to preserve it, as well as with tea and with coffee. It is used in preserving flowers, and even of wood. It is sometimes used for diluting aniline colors. Its most familiar use is of course as a condiment in many food preparations, such as cakes, confectionery and carbonated beverages. It must be remembered, however, that sugar is of value apart from its agreeable taste; it is a 100 per cent fuel food.

2. As a matrix or medium for extractive processes, as in the case of phosphate of lime from dolomite and calamine, as well as in the liming of hides.

3. As a factor in various compounds, sugar enters into the manufacture of Chinese cement and of various explosives.

4. As a reducing agent, it is used in the manufacture of carbon monoxide and sulfurous acid, and in the manufacture of mirrors.

5. As a raw material sugar is used in many industries, such as the manufacture of alcohol, artificial ciders, vinegar, whey, a number of organic acids, such as acetic, lactic, metacetonic, formic, butyric, levulic, tartaric and saccharic. In the synthetic production of a number of compounds sugar serves as the starting point; some of these are acetone, acetic saccharose, arsenic saccharose and hexabenzoic saccharose.

6. In the preparation of various kinds of sealing waxes, copying inks, hektograph inks, liquid glue, transparent soap, cloth finishes, leather dressings and other materials in common use, sugar plays an important part.

In forty years, from 1870 to 1910, the world's consumption of sugar has increased from less than two and a half million tons to over seventeen million tons.

Matches and Fire

EACH year there are manufactured in the United States about $6,000,000 worth of matches. In addition, the imports amount to $370,000. It is probable that 99.9 per cent of those matches performed the duty for which they were made and then become harmless. The remaining 0.1 of one per cent, or $6,370 worth, may be held accountable for probably $60,000,000 worth of damage caused by fires resulting from careless use of matches. They may also be held indirectly accountable for $250,000,000 worth of damage caused by fires annually in the United States, not to mention an equal amount expended annually in the United States for fire protection and fire insurance. The returns on this investment of $6,370 are probably greater than on any other similar investment which we make, aggregating, as they do, probably $80,000 for each dollar invested. The dividends, however, are negligible.

ELECTRONS AND THE ELECTRONIC THEORY are discussed by Sir Oliver Lodge in Scientific American Supplements 1428, 1429, 1430, 1431, 1432, 1433, 1434. Price 10 cents each. For sale by Munn & Co., Inc., and all newsdealers.

Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12639) S. C. asks: Why does a wheel on a carriage in a moving picture have the appearance of going backward, when it is going forward? I have noticed this several times, and have always been anxious to know. A. In taking a moving picture there are perhaps 16 exposures made each second. If now the spokes of the wheel of a carriage move with a speed so that the spokes are in the same position at each exposure, that wheel will seem to stand still in the picture. If the wheel is moving slower, then the spokes will be seen farther backward in the successive views and the wheel will seem to turn backward, while it will seem to turn forward when the spokes move fast enough to occupy positions farther forward in each exposure. It is a matter of the interruptions for the exposures and the motion of the wheel. If there are 16 exposures and the wheel turns through the space between two spokes in 1/16 of a second, the wheel would be in the same position at each successive exposure, and so would not seem to move at all. If it turned through a less angle than there is between two spokes in 1/16 of a second, the wheel will seem to turn backward.

(12640) R. C. C. asks: 1. In Young's "Manual of Astronomy," page 301, the statement is made that the tide opposite the moon (that is, the tide on the earth's surface which is turned away from the moon) is caused by the action of the force of gravitation. Newcomb's "Astronomy," page 91, states that this tide is due to centrifugal force. Which explanation is accepted at the present time? A. The tide-producing force is the attraction of the sun and the moon upon the waters of the ocean, differing from their attraction upon the solid parts of the earth. The waters being free to move are moved toward the moon and the sun on the side of the earth toward those bodies, while on the side of the earth remote from the sun and moon, the earth as a whole is drawn away from the water of the ocean. You will find a sufficiently full consideration of the subject in Young's "General Astronomy," Sections 462-484. We will send you the book for $3.05 postpaid, and shall be pleased to receive your order for it. Centrifugal force could not cause a tide which would flow around the earth as the tide flows. It piles the water up around the equator, and holds the earth in equilibrium with its equatorial diameter 26 miles greater than its polar diameter. 2. Is Utocolor on sale in this country at the present time? If not, where can it be obtained? A. We regret we are unable to give you the information you are seeking as regards your second inquiry. 3. Will you please tell me the title of a good book on color photography? A German book on that subject was reviewed in the SCIENTIFIC AMERICAN some time ago, but I cannot find that issue in my files. A. We can supply the following books treating on color photography: "Photographic Optics and Color Photography," by G. L. Johnson, $3; "Photography of Coloured Objects," by C. E. K. Mees, 50 cents. We forward these books postpaid at the prices quoted above.

(12641) M. McC. says: 1. Are there places in the ocean where it is impossible to reach bottom by sounding? If so, at what depth can a sounding be made? Why cannot bottom be reached? A. There are no places known in the ocean which cannot be sounded. The deepest places are nearly six miles deep. There is no reason why a sounding weight should not go to the bottom anywhere. 2. Is it possible, if the water in the ocean was deep enough, that any object, iron, a steel boat, etc., could sink to a certain depth and remain without touching the bottom? If so, why? If not, why? A. It is not possible that water can be deep enough on the earth that a lead or iron sinker would not drag a sounding wire down to the bottom. An iron object of any shape which will sink at the surface will go quite to the bottom anywhere in the ocean. The reason is that water is but slightly compressed by the greatest pressure in the ocean, and any object as much heavier than water as iron is, will still be heavier than the water at any possible depth. 3. What is the pressure per square inch at one mile, two miles, five miles deep? A. The pressure in the ocean at the depth of one mile is about 2,300 pounds per square inch. The pressure does not affect the sinking of a ship or other body in the water. It will sink if it is heavier than water. That pressure does not affect sinking can be seen by considering the air. We fall in the air with ease and swiftly, although the pressure is fifteen pounds per square inch upon us. 4. Would the "Titanic," the ship which has just sunk, touch the bottom in two miles of water, or in three, leaving out the possibility of air compartments, etc. If not, why? A. The "Titanic" went directly and swiftly to the bottom, as will be seen from No. 3.

NEW BOOKS, ETC.

THERMODYNAMICS OF THE STEAM TURBINE. By C. H. Peabody. New York: John Wiley & Sons, 1911. 8vo.; 282 pp.; illustrated. Price, $3 net.

Technical students, who have so largely benefitted by Prof. Peabody's works on engines, boilers, and naval architecture, are placed under further obligation to him by this, his latest textbook. It is a carefully arranged study of the laws of thermodynamics, particularly in their application to jets, vanes, and turbines. Those who are well grounded in general thermodynamics will have no difficulty in coming to an understanding of simple impulse turbines, pressure compounding, velocity compounding, and reaction and marine turbines. Good diagrams and inserts supplement the text. Generally speaking, the accepted methods of steam-turbine designers have been adhered to, but in many instances the author has improved upon the facility and accuracy of these methods to no small degree.

BEAUTY CULTURE. A Practical Handbook on the Care of the Person. Designed for both Professional and Private Use. By William A. Woodbury. New York: G. W. Dillingham Company, 1911. Price, $2.

Instead of the promiscuous recipes and treatments which go to make up the average handbook of this kind, we have in "Beauty Culture" an orderly series of papers, arranged according to the parts of the body. The care of the feet, of the hair, of the skin, of the teeth, flesh reduction and flesh development, are all quite exhaustively treated. In combination with the instructions for facial massage we are given a cut showing the muscles of the face and the direction of their contraction, thus plainly indicating the direction the massage stroke should take. This is an example of the thoroughness with which each branch of the subject is presented.

THE BRITISH MUSEUM: ITS HISTORY AND TREASURES. By Henry C. Shelley. Boston: L. C. Page & Co., 1911. 8vo.; 355 pp.; illustrated.

In a single rich volume the author of "Inns and Taverns of Old London" sketches for us the origins and growth of the British Museum, and spreads before us a selection of relics and treasures from among its vast store. The plans of the different floors are given by inserts, and among the numerous and good illustrations is a wide range of objects, from manuscripts by Oliver Cromwell and John Keats to the baked-clay cylinder of Sennacherib; from bronze litter-handles to Italian caskets; from the so-called bust of Clytie to the Elgin marbles. The main divisions deal in turn with the printed books, the manuscripts, the relics of Greece and Rome, the Egyptian antiquities, the Babylonian and Assyrian antiquities, prehistoric man, civilization in the making, and the arts of life. Those who have visited the Museum will find in this work a pleasant reminder of an intellectual feast; those who have not visited it may still gain a pleasure worth the having by scanning Mr. Shelley's offering.

PLANT LIFE AND EVOLUTION. By Douglas Houghton Campbell. New York: Henry Holt & Co., 1911. 8vo.; 360 pp.; illustrated. Price, $1.60 net.

This is one of the latest volumes of the well-written "American Nature Series." It is published for the popular need, and treats of the physical origin of life and its modes of continuance in vegetable substances; of plants as the manufacturers of all organic food; of heredity, ontogeny, environment and selection as factors in evolution; and of the problems of plant distribution. A branch of the subject which appeals to everyone, that of the human factor in plant evolution, is given a separate chapter, as is also a summary on the origin of species.

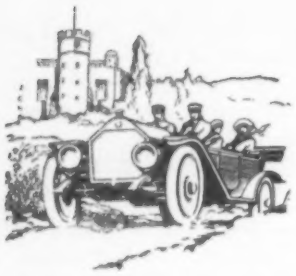
THE WONDERS OF MODERN ENGINEERING. By Archibald Williams, B.A. Philadelphia: J. B. Lippincott Company. 1911. 8vo.; 160 pp.; illustrated.

The book is composed of papers taken from the author's larger work entitled, "The Romance of Modern Engineering," and contains brightly-written descriptions of such engineering feats as the construction of the Forth bridge, the harnessing of Niagara, and the building of the Nile dam. The eight full-page plates are well selected to exhibit to the best advantage the marvellous features of bridge construction, dam building, and machinery design. The text is thickly bestudded with figures, but they are so presented as to add to the thrill of wonder rather than to depress with a sense of dullness.

PHOTOGRAPHY. Its Principles and Applications. By Alfred Watkins, F.R.P.S. New York: D. Van Nostrand Company, 1911. 8vo.; 333 pp.; illustrated. Price, $2 net.

Mr. Watkins has attained his present distinguished position in the world of photography only after a long and busy apprenticeship. Thirty-five years ago he was traveling about with wet-plate impedimenta—portable tent and all—not forgetting the spirit lamp necessary in cold weather to thaw slivers of ice in the bath and developer; for any old-timer can tell you that it was necessary to develop while the plate was still wet! Little space, however, has been given to mere history. First principles are set forth, and development influences are dealt with in a practical way, the accompanying illustrations making the author's points very clear. The various printing processes are recounted at some length, and enlarging, slide-making, color photography and process work all receive special consideration. As a handbook of practical instruction and advice the work is decidedly pleasing and acceptable.

Why we lead the world in lubrication.



In addition to the American market, we supply lubricants to over 70 foreign automobile manufacturers.

Words and claims—no matter how oily—won't lubricate your car.

Your business sense asks:

"Who made the oil?"

We will sketch briefly the experience behind the oils recommended below.

Power-engineers all over the world recognize the authoritative leadership of the Vacuum Oil Company.

From Stockholm to Cape Town, from New York to Shanghai, leading manufacturing plants depend on our Gargoyle brand lubricants.

We supply 75% of the world's battleships, most of the ocean greyhounds, and practically every aeroplane in active use. Outside of the American market, we furnish lubricants to over seventy foreign automobile manufacturers.

Such buyers show small interest in words and claims, or price per gallon.

They select an oil for only one reason—because it gives more and better lubrication *per dollar expended*.

That necessitates both the right *quality* of oil and the correct *grade* for the purpose.

The success of Gargoyle Mobiloils with American and foreign automobilists is due to exact manufacturing methods.

Before making our recommendations, we analyzed the construction of every American car and practically every foreign make.

That was not easy. But correct lubrication is not an easy problem.

Different makes of automobile motors differ widely. Several distinct grades of lubricating oils were needed.

We produced these oils, distilling and filtering them to remove free carbon.

The various grades were given the following names:

Gargoyle Mobiloil "A."
Gargoyle Mobiloil "B."
Gargoyle Mobiloil "D."
Gargoyle Mobiloil "E."
Gargoyle Mobiloil "Arctic."

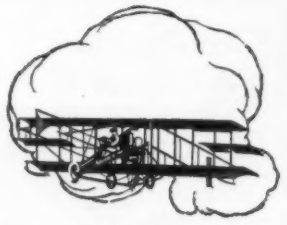
Below you will see listed the correct grade of oil for 111 makes of automobiles—for both Summer and Winter.

Space limits the list of cars. On request we will supply our more complete list with recommendations.

Gargoyle Mobiloils are put up in barrels, half-barrels, in 5 and 1 gallon sealed, white cans. All are branded with the Gargoyle which is our mark of manufacture.

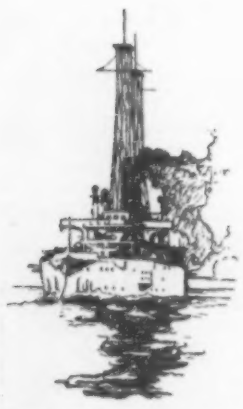
They are handled by the higher class garages, auto-supply stores and others who supply lubricants.

VACUUM OIL COMPANY
Rochester, U. S. A.
Distributing Warehouses in the Principal Cities of the World.



We supply lubricants to practically every aeroplane in active use.

We supply lubricants to the leading ocean steamship companies all over the world.



We supply lubricants to the navies of the world's leading naval powers.

We supply lubricants to leading manufacturing plants in every quarter of the globe.

A guide to correct Automobile lubrication

Explanation: In the schedule, the letter opposite the car indicates the grade of Gargoyle Mobiloil that should be used. For example, "A" means "Gargoyle Mobiloil A." "Arc" means "Gargoyle Mobiloil Arctic." For all electric vehicles use Gargoyle Mobiloil A. The recommendations cover both pleasure and commercial vehicles unless otherwise noted.

MODEL OF CARS	1908		1909		1910		1911		1912	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Abbott Detroit	...	...	...	...	A	Arc.	A	Arc.	A	Arc.
Alco	...	...	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
American	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Apperson	E	E	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Atlas	A	A	E	E	E	E	E	E	A	A
" Com'l	...	...	E	E	E	E	Arc.	Arc.	A	A
Austin	A	A	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Autocar (2 cyl)	B	A	A	Arc.	A	Arc.	A	Arc.	A	Arc.
" (2 cyl) Com'l	...	...	A	Arc.	A	Arc.	A	Arc.	A	Arc.
" (4 cyl)	A	E	A	E	A	E	A	Arc.	A	Arc.
Bena	...	...	A	A	A	A	A	A	A	A
Bergdoll	...	...	...	...	A	Arc.	A	Arc.	Arc.	Arc.
Brush	A	A	A	E	A	E	A	E	A	E
Buick (2 cyl)	A	A	A	A	A	A	A	A	A	A
" (4 cyl)	A	Arc.	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.
Cadillac (1 cyl)	A	E	B	A	...	...	...	...	...	...
" (4 cyl)	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Cartercar	A	E	A	A	A	E	A	E	A	E
" Com'l	B	A	A	A	A	E	A	Arc.	A	Arc.
Case	...	...	...	...	...	...	A	A	A	Arc.
Chadwick	A	A	A	A	B	A	A	Arc.	A	Arc.
Chalmers	...	...	Arc.	Arc.	Arc.	Arc.	A	A	Arc.	Arc.
Chase	B	B	B	B	B	B	B	B	B	B
Cole	...	...	...	...	Arc.	Arc.	A	A	Arc.	Arc.
Columbia	A	E	A	E	E	E	A	A	A	A
Columbia Knight	...	...	...	...	...	...	...	...	A	A
Couple Gear	A	A	A	A	A	A	A	A	A	Arc.
Croxton-Keeton	...	...	...	...	A	Arc.	A	Arc.	Arc.	Arc.
Daimler	A	E	A	E	A	E	A	E	A	A
Daimler Knight	...	...	...	...	...	...	A	E	A	A
Darracq	A	E	A	E	A	E	A	E	Arc.	Arc.
De Dion	B	A	B	A	B	E	B	A	B	A
Delahaye	A	A	A	A	A	A	A	A	A	A
Delaunay-Belleville	B	A	B	A	B	A	B	A	B	A
Elmore	A	A	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
E. M. F.	...	...	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Fiat	A	E	B	A	A	E	B	A	A	A
Flanders	...	...	...	...	E	E	E	E	Arc.	Arc.
Ford	A	E	E	E	A	Arc.	E	E	E	E
Franklin	B	E	B	E	B	A	A	Arc.	A	Arc.
" Com'l	B	E	B	A	B	A	B	A	A	Arc.
Gramm	...	...	...	...	...	...	A	Arc.	A	Arc.
Gramm-Logan	...	...	A	Arc.	A	Arc.	...	...	...	...
Hewitt (2 cyl)	...	...	A	A	A	A	A	Arc.	...	...

MODEL OF CARS	1908		1909		1910		1911		1912	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Hewitt (4 cyl)	A	A	A	E	A	E	A	Arc.	E	E
Hudson	...	...	...	...	Arc.	Arc.	A	Arc.	A	Arc.
Hupmobile	...	...	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
International	B	A	B	A	B	A	B	B	B	A
Interstate	...	...	A	A	A	A	A	A	Arc.	A
Isotta	A	E	A	A	A	A	A	A	A	A
Itala	...	...	A	A	A	A	A	A	...	...
Jackson (2 cyl)	A	A	A	A	A	A	...	...	...	...
" (4 cyl)	A	E	A	E	A	Arc.	A	Arc.	A	Arc.
Kelly	...	...	...	...	...	...	Arc.	Arc.	Arc.	Arc.
Kissel-Kar	A	E	A	E	A	E	A	E	A	Arc.
" Com'l	...	...	...	...	...	...	Arc.	Arc.	Arc.	Arc.
Kline Kar	...	...	...	...	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Knox	B	E	B	A	B	A	B	A	B	A
Krit	...	...	...	...	A	A	A	A	A	A
Lambert	A	E	A	A	A	Arc.	A	Arc.	A	Arc.
" Com'l	A	A	...	...	...	...	A	E	A	E
Lancia	B	A	B	A	B	A	B	Arc.	B	Arc.
Locomobile	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Losier	A	A	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Mack	A	A	A	E	A	E	A	E	E	E
Marion	A	A	A	E	A	E	A	E	A	Arc.
Marmon	B	E	Arc.	Arc.	A	E	A	Arc.	Arc.	Arc.
Matheson	A	E	Arc.	Arc.	Arc.	Arc.	A	A	A	Arc.

MODEL OF CARS	1908		1909		1910		1911		1912	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Maxwell (2 cyl)	E	E	E	E	E	E	E	E	E	E
" (4 cyl)	...	...	E	E	E	E	Arc.	Arc.	Arc.	Arc.
Mercedes	A	E	A	E	A	E	A	E	A	E
Mercedes Knight	...	...	...	...	...	...	A	A	A	A
Mercer	...	...	...	...	A	Arc.	A	Arc.	A	Arc.
Minerva Knight	...	...	...	...	...	...	A	A	A	A
Mitchell	A	E	A	A	Arc.	Arc.	A	Arc.	A	Arc.
Moon	A	E	A	E	A	E	Arc.	Arc.	Arc.	Arc.
National	A	E	A	Arc.	A	A	A	A	A	A
Oakland	...	...	A	E	A	E	A	Arc.	A	Arc.
Oldsmobile	A	E	A	E	A	E	Arc.	A	Arc.	A
Overland	A	E	A	E	A	E	Arc.	Arc.	Arc.	Arc.
Packard	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Panhard	A	E	A	E	A	E	A	E	A	Arc.
Panhard Knight	...	...	...	...	...	...	A	A	A	A
Peerless	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pennsylvania	A	E	A	E	A	E	A	A	...	...
Pierce Arrow	A	E	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.
" Com'l	...	...	...	...	...	...	Arc.	Arc.	Arc.	Arc.
Pope Hartford	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Premier	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Rambler	A	E	A	A	A	A	A	Arc.	Arc.	Arc.
Rapid	A	A	A	A	A	A	A	Arc.	Arc.	Arc.
Regal	...	...	A	E	A	E	A	A	A	E
Renault	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Reo	A	A	A	A	A	E	A	Arc.	A	Arc.
Royal Tourist	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Selden	A	E	A	E	A	E	A	E	Arc.	Arc.
Simplex	A	E	Arc.	Arc	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Speedwell	...	...	A	Arc.	Arc.	Arc.	A	Arc.	A	Arc.
Stanley	D	D	D	D	D	D	D	D	D	D
Stearns	A	E	A	A	Arc.	Arc.	A	Arc.	A	Arc.
Stearns Knight	...	...	...	...	...	...	...	...	A	A
Stevens Duryea	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Stoddard Dayton	...	...	E	E	Arc.	Arc.	A	A	A	A
Stoddard Dayton–Knight	...	...	...	...	...	...	...	...	A	A
Thomas	A	E	E	E	E	E	E	E	A	E
Walter	A	E	A	E	A	E	Arc.	Arc.	Arc.	Arc.
Welch	A	E	A	E	A	E	...	...	...	...
Welch Detroit	...	...	...	...	...	...	A	E	...	...
White (Gas)	...	...	...	...	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" (Steam)	D	D	D	D	D	D	D	D	D	D
Winton	A	E	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc

GARGOYLE

Mobiloil

A grade for each type of motor.